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N. P. T. A. Hold Fall Meeting at Chicago

Large and Representative Attendance At Annual Fall Meeting of the National Paper Trade Association Held In Chicago, Sept. 18-21 — Program Devoted To Practical Merchandising — Fifty Companies Exhibit.

[FROM OUR REGULAR CORRESPONDENT]

CHICAGO, Ill., September 25, 1939—A determination to do all within its power to prevent hysteria and to keep the paper industry closely united to avoid any possible criticism of its procedure, characterized the semi-annual meeting of the National Paper Trade Association held at the Stevens Hotel, Chicago, September 18 to 21.

Attendance was large and representative. It was, in a certain sense, an "emergency program" made so by the European situation which developed after the planned program was made ready. Nevertheless, paper executives termed it a most gratifying coincidence "that the industry could be in general session when it received the added responsibility of dealing with the international situation."

This observer feels that the keynote of the meetings was an often expressed desire that the paper industry approach the war situation in the keen realization that it was and is "on the spot" and that any rank profiteering, any advantages taken by the industry over and above the return of rightful profits would place the industry in a dangerous position. There is a belief that unless business handles itself in a way that will be above reproach, there are many who will want to declare an "emergency" and place business under a system of regimentation under which it may be forced to operate for years to come.

Program Devoted to Practical Merchandising

The program itself was unique in that it paid particular attention to selling—to constructive and profitable merchandising to discount the years of "profitless prosperity." The lead off speaker, Ralph W. Carney, sales manager of the Coleman Lamp and Stove Company, stressed selling in his speech before the Fine and Wrapping Paper Divisions on the morning of September 18. His remarks were followed by a discussion of the work done by the Fair Labor Standards Committee as presented by A. W. Leslie and a discussion of adjustments in the paper industry as required by law and given by J. K. Javits, counsel for the industry.

Address of D. C. Everest

Speaking on the subject of "Calm evaluation of facts necessary," D. C. Everest, president of the American Paper and Pulp Association said:

"I am glad to be with you tonight and to join in this discussion, and particularly to extend to you the greetings and best wishes of the American Paper and Pulp Association. In the first World War our two associations faced the most serious problems which the industry had ever known and many of them were made solvable by the understanding which joint consideration encouraged. Today we face a similar situation. In behalf of the American Paper and Pulp Association I want to assure you that we stand ready to join in the same brand of intense cooperation that proved helpful over two decades ago.

"It is assuring to know that our Associations are today better prepared, more fully representative and more sufficiently supported than they were before. During the intervening years we all have had opportunity to know more about the industry of which we are a part. We are consequently better equipped to govern ourselves in the best interests of everybody concerned.

"It seems to me that the first thing we must make up our minds to face is reality. As this whole performance winds up and as the tension increases, we must never lose sight of the fact that some day it must unwind. Depression is the inevitable aftermath of war. It may be delayed, it may be tempered by other conditions, but throughout history it has never failed to strike. Realism demands, therefore, that in the winding up process, we constantly consider how we are going to unwind.

"There are certain facts that I think should be kept in mind.

"The first is that paper consumption has reached new high levels, that more paper is constantly being required for new uses and that old uses are demanding greater volume. Under pressure of war conditions both diversification and volume of use are bound to grow. Our overall production this year has run approximately at the rate of 13,000,000 tons a year. This is likely to be our biggest production year; this would in all probability have been true even had there been no abnormal war stimulation.

"The second fact is that insofar as paper is con-

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Canada Favors $50 Price for Newsprint

Some Large Producers Assure Customers Present Price Will Be Maintained To Equal International Paper Co.'s Announced Price of $50 Per Ton First Quarter of 1940—Mills Active In Newfoundland—Other News.

[FROM OUR REGULAR CORRESPONDENT]

MONTREAL, Que., September 25, 1939 — While newsprint producers here have issued no general statement regarding the price of newsprint for the coming year, there appears to be no disposition to differ from the policy officially announced by the International Paper Company to continue the present price of $50 per ton until March 31st, 1940. Indeed, assurances to the effect that this price will be maintained have already been forwarded to their customers by certain large newsprint manufacturing companies, who regard this as the best contribution they can make to preserve stability in the publishing business. Producers here have the advantage of experience at the time of the last war to guide them, and there can be no doubt whatever not only that they will do everything in their power to promote the policy already announced on their behalf by the Newsprint Association of Canada of supporting a sound and orderly market, but that they will make it their first concern to assure a continuous and regular supply to meet the requirements of their customers. They will discourage by all means in their power methods of buying and selling which might cause a disorderly market and will avoid any attempt to profiteer. The present price will be adhered to as long as possible, and if a change in price should occur the effort will be to indicate it "just as far in advance as possible."

Complete Change in Newsprint Situation

Meantime, under the heading "Cyclonic Change," the Financial Times of Montreal has this to say:

"In the pulp and paper industry there has been a complete change in the situation. It is now entirely a seller's market, whereas for the last few years it has been more or less a buyer's market. So far, of course, it has affected the pulp products more than newsprint, but there are scores of buyers in the market from the United States trying to tie up different companies on contracts that should run at a special price over a period of time. Profiting by the experience that they had in 1914-20 most companies are holding aloof even at prices well above current quotations. There is a feeling that the situation is so unusual that the only thing to do is to deal with it from time to time. Of course the Canadian companies are looking after their customers to the fullest extent possible, but when it comes to inquiries from new sources, which had been buying from European countries, there is a belief that nobody can tell what prices are going to be, and the longest term that people should make for any contract is at the outside around thirty days.

Limited Stocks Now on Hand

In other words the belief exists that with the limited supplies of pulp and paper on hand there can be only so much at any one price, and on this account the situation has developed into one that should be dealt with rather from the whole industry than by any individual company. Since 1920 there has developed hundreds of new customers in the United States, particularly for different grades of pulp, as a result of the various new products that have been turned out. These interests, in order to continue their lines, can afford to pay big advances over current prices, and their offers have made it difficult for the different Canadian companies to know just how to deal with the situation. The newsprint companies have also been forced to step up their production to a considerable extent, because many of the daily and weekly papers in the smaller American centres have been accustomed to getting their requirements from overseas, and are now dependent on shipments from Canada. On the other hand the Canadian mills are not willing to open up mills in which higher costs prevail, as they find it difficult to know just how long the present conditions are likely to last. In the meantime, however, a complete new set of conditions have developed for the pulp and paper industry in Canada, and, given a fair period of time, they should make up in great part for the losses sustained for years past."

Pay of Lumberjacks Increased

The Quebec Government, by Order-in-Council, has decreed a minimum wage of $45 per month plus board and lodging for lumberjacks employed in the woods of the Province.

In addition to the minimum for wage workers employed by the hour, the government measure also fixed a minimum of $2 per 100 cubic feet for lumberjacks hired on a piece-work scale. In making the announcement, Premier Duplessis said that the minimum of $45 a month plus board and lodging represented a total salary of approximately $65 a month, which was a higher rate than lumberjacks had ever received in the past.

The working day in the lumber camp has been limited to 10 hours with a 60-hour week as a maximum. In cases where overtime is absolutely necessary the employee will receive time and a quarter.

Increased Activity in Newfoundland

News from Newfoundland indicates that the situation in regard to the pulp and paper market is being watched with great interest. The Bowater's mill at Corner Brook, which has a capacity of 1,260,000 lbs. of newsprint per day, is running at capacity while the Anglo-Newfoundland Development Company's mill at Grand Falls, which has a capacity of 1,200,000 lbs. of newsprint and wrapping paper per day, is running on a five-day week.

H. M. S. Lewin, general manager of Bowater's Newfoundland Pulp and Paper Mills, has stated that the company will proceed with the extension to the sulphite mill at Corner Brook, despite the war, and expects to start manufacture and export of pulp from the new plant considerably earlier than had been planned. The present capacity of the sulphite plant is 250,000 lbs. per day, and the plans call for an increase of 100 tons per day.

Kimberly-Clark Plans Addition to Plant

Heavy Demand For Black Wadding For Insulation Use Causes Kimberly-Clark Corp. To Transfer Its Manufacture To Neenah and Plan To Increase Production—Wolf River Reservoir Bill Signed — Other News.

[FROM OUR REGULAR CORRESPONDENT]

APPLETON, Wis., September 25, 1939—Tentative plans for a substantial addition to its plant at Neenah, Wis., and a shift in manufacturing operations on insulation material were announced last week by Kimberly-Clark Corporation.

S. F. Shattuck, vice-president, declared that the manufacture of black wadding, an insulation material used for houses and automobiles, is to be transferred from its mill at Niagara Falls, N. Y., to its Badger-Globe mill at Neenah. Because of the increasingly heavy demand for this product, the corporation decided to have its Neenah mill take over the manufacturing job. The No. 1 wadding machine at Badger-Globe will be remodeled and both production and employment will be substantially increased.

As another step in preparation, according to a letter addressed to the city council of Neenah, by F. E. Sensenbrenner, assistant secretary, is the construction of a bridge at the rear of the Badger-Globe mill across the Fox River canal for use of the company's trucks and the employees. The council was requested to purchase the necessary land for an outlet to the bridge, and approved of an appropriation of $2,000 for this purpose. The bridge will be 100 feet long, and will be built by Kimberly-Clark. It will relieve congestion now existing by use of the bridge on Commercial St. east of the mill, and will facilitate trucking between Badger-Globe and Lakeview mills, which is extensive daily.

Mr. Sensenbrenner explained in his letter that the company was planning increased manufacturing capacity, and that the acquisition of the bridge outlet would make it possible to build substantial additions to the Neenah plants. No definite announcement of the exact nature of the bulding plans has been made.

More Water for Wisconsin River Mills

Added Wisconsin River power flowage for paper mills is assured by the passage of a bill by the Wisconsin Legislature last week permitting the Wisconsin Valley Improvement Company to proceed with construction of a storage reservoir on the Little Eau Pleine River near Knowlton, Wis. The bill changed the company's original charter of 1907 so it can acquire and maintain additional dams on the river to produce a uniform flowage of water for power purposes.

The proposed reservoir will be a companion project to the Big Eau Pleine reservoir completed several years ago, but will not be quite as large. The bill enables the company to acquire 85 per cent of the land in the entire district affected, where previously it was required that 85 per cent be acquired in each township.

Leading in this movement has been the Consolidated Water Power and Paper Company, Wisconsin Rapids, Wis., one of the largest beneficiaries. The company financed the Big Eau Pleine reservoir, and is expected to have a major part in constructing the new one. Plans also had been announced previously to build a power dam and hydro-electric plant at Knowlton to increase Consolidated's generating capacity.

Wolf Reservoir Bill Signed by Governor

The last obstacle also has been removed for the construction of the reservoir on the upper Wolf River at Lily, Wis., for the benefit of Fox River Valley paper mills. The bill granting a charter for this purpose to the Wolf River Reservoir Company has been signed by Governor Julius P. Heil. Harry E. Brooks, secretary of the company, said a meeting would be held this week to arrange the financing. He also declared an attempt would be made to start work on the dam this fall and carry construction through the winter season so the reservoir could be in operation next spring to impound flood waters for the benefit of Fox River flowage next summer. Charles Seaborne of the Thilmany Pulp and Paper Company, Kaukauna, Wis., who has worked for four years to bring this project to a head, and T. E. Orbison, paper mill consulting engineer of Appleton, Wis., who worked with the promoters on the project, were present at the capital at Madison, Wis., when the governor signed the bill.

Public Service Opposes Higher Freight Rates

Aiming to "protect the welfare of the state and its citizens," the Wisconsin Public Service Commission has taken a hand in the fight to prevent increases in freight rates on paper products shipped from Wisconsin to the southwest. A brief has been filed with the Interstate Commerce Commission, based on studies made by P. H. Porter, W. F. Ehmann and C. E. Schreiber of the Commission's staff.

"The ultimate fate of the industry has been of serious concern to the state for several years," the brief explains. "The paper industry of the nation 15 years ago was located principally in Wisconsin, Minnesota, Michigan, New York and New England states. Since that time there has been a substantial economic change resulting in the construction of many new mills in other sections of the country. A large number of markets for paper produced in the north have been lost."

Exhibits accompanying the brief show that the south has many advantages over Wisconsin and that southern mills are a serious threat to this state's industry. Value of paper and paperboard products produced in Wisconsin dropped from 90 million to 72 million dollars from 1927 to 1935. During the same period the value of similar products increased from 17 million to 37 million dollars in a group of southern and southwestern states.

From 1929 to 1935 Wisconsin's production dropped nearly 100,000 tons, while Louisiana's increased

176,000 tons, the brief points out. Southern states have a great advantage over Wisconsin through lower materials and labor costs. "The cost of material per ton of paper in Wisconsin is $59.58, compared with $31.90 in Louisiana, $25.55 in Tennessee, and $29.59 in other southern states," the commission says.

"Northern mills must go farther afield for their wood and many times find it cheaper to purchase pulp manufactured in Scandinavian countries and ship it to Wisconsin than to produce pulp locally. These are reasons why northern states cannot afford to have their freight rates on paper further increased and survive the growing competition."

Strange and Weitzul Nuptials

One of the most fashionable weddings of the fall season in the Fox River Valley was solemnized Tuesday evening, September 19, at All Saints Episcopal Church at Appleton, Wis., when Miss Mary Alsted became the bride of John G. Strange. The Rev. William J. Spicer read the marriage service in the presence of approximately 170 guests. A reception was held afterwards at the Alsted residence, prior to the departure of the couple on a honeymoon trip to California.

Miss Alsted is the daughter of the late Lewis L. Alsted, president of Combined Locks Paper Company, and Mr. Strange is a son of Hugh M. Strange, secretary-treasurer and general manager of the John Strange Paper Company, Menasha. The bridegroom is secretary of the Institute of Paper Chemistry, Appleton, Wis. Upon their return, the couple will reside at 673 Oak st., Neenah, Wis.

Edward A. Weitzul, of the engineering staff of the Kimberly-Clark Corporation, Neenah, Wis., and Miss Mary McCaffrey of Plymouth, Wis., were married September 16 at St. John the Baptist Church at Plymouth. Their honeymoon will take them through the eastern states and Canada, and they will reside at Neenah, Wis.

New Paper Mill for Philippines

According to the office of the American Trade Commissioner, Manila, Philippine Islands, "The National Development Company reports that the study for the establishment of a pulp and paper mill has been completed and is now under consideration by the National Development Company Board. It is planned to establish a pulp and paper mill as part of a general scheme for the creation of a chemical industry by the National Development Company. Inasmuch as the plan involves the spending of 14,000,000 pesos, and a pulp and paper mill is only one aspect to the plan, it appears that some time will elapse before any definite decisions will be made."

Goes With Munro & Church Co.

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., September 25, 1939—Charles W. Morrison, for thirty-five years connected with a large Eastern mill, in late years as manager of sales, is now associated with Munro & Church Company, of 10 High street.

Mr. Morrison's extensive experience in the board business and his wide acquaintance with the New England trade promise to make the new connection both happy and profitable.

Florida Pulp & Paper Co. To Build

James H. Allen, former vice president and manager of the Union Bag and Paper Corporation plant at Savannah, Ga., heads a new company which plans to erect a $3,000,000 plant at Pensacola, Fla., to manufacture white book and wrapping paper, it was announced through an Associated Press dispatch which was mentioned briefly in the PAPER TRADE JOURNAL last week. The Pensacola dispatch follows:

"Organization of the Florida Pulp and Paper Company for the construction of a $3,000,000 plant to manufacture white book and wrapping paper at Pensacola was announced here today by John C. Pace and A. D. Pace, brothers, and James H. Allen of Savannah.

"The Pace interests, which previously operated sawmills in this section, have put up 95,000 acres of pine lands which will produce indefinitely 50,000 cords of pulp wood a year, Allen, who will be president of the company, said.

"Allen resigned as vice president, director and manager of the Union Bag and Paper Corporation in Savannah to head the company here.

"The plant, which would consist of a pulp and paper mill and a bleaching unit, will hire at the outset approximately 500 workers, company officials said. Others would be employed in the woods.

"Members of the city council, at an informal meeting last night, agreed to assist the company in procuring a suitable site. Options on several possible sites have been obtained, John C. Pace said.

"Chamber of Commerce officers also pledged the new concern co-operation.

"Allen said that 75 per cent of the necessary capital had been obtained and a market for the product had been arranged. He said he hoped to complete all preliminaries and be able to break ground for the plant by February 1.

"Although a definite site has not been decided upon, the company expects to be located on the waterfront immediately adjacent to but outside the limits of Pensacola."

To Represent Morris Machine Works

Morris Machine Works of Baldwinsville, N. Y., announce the reappointment of Pierce J. McAuliffe as New York representative with offices at 254 West 31st street, New York City. Mr. McAuliffe originally joined the company in 1910 as designer of hydraulic dredging equipment. During the War he was with the Construction Division of the Emergency Fleet Corporation, becoming manager of ship construction in 1918. He rejoined Morris Machine Works in 1920 and has since been continuously associated with the company, first as New York representative, and later holding executive positions at the home office in Baldwinsville. Mr. McAuliffe will be in charge of the sales of Morris centrifugal pumps, hydraulic dredges and steam engines in the New York territory.

George C. Andrew Retires

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., September 25, 1939—George C. Andrew, vice-president in charge of sales of the Monadnock Paper Mills, Bennington, N. H., with headquarters in this city, has retired from active business.

Government Advises Against Abitibi Sale

Ontario Minister of Lands and Forests Informs Bondholders' Committee Sale of Assets of Abitibi Power & Paper Co. Not Advisable Now—Findings In Container Trade Conspiracy Charges — Other Industrial News.

[FROM OUR REGULAR CORRESPONDENT]

TORONTO, Ont., September 25, 1939—The Ontario government has advised the Bondholders Protective Committee of the Abitibi Power & Paper Company, Limited, Toronto, against an attempt at judicial sale of the assets at the present time. Hon. Peter Heenan, Minister of Lands and Forests for Ontario, stated in the Legislature that, in view of changed world conditions, the government had come to the conclusion that it would be inadvisable if proceedings for a sale of the properties of the company were taken at the present time, and this decision had been made known to the Bondholders Protective Committee. An early settlement is now looked for and, during the past month, the earnings of the company increased.

Since the announcement of the Ontario government that there would be no sale of the properties the bonds have jumped up several points. When the foreclosure policy was announced some time ago the bonds took a sudden drop. In other words, the foreclosure was regarded as a declaration of war and long conflict, and the new policy as being a movement in favor of peace. The press generally is commending the Ontario government for recognizing that the policy of judicial sale or foreclosure of the company on a plan which would virtually shut out all equity interests and unsecured creditors would be a mistake.

Bondholders Expected To Reach Agreement

It is now assumed by Abitibi security interests that the Bondholders Protective Committee will not proceed with the sale against the recommendations of the Ontario government, and that the various interests will now get together and reach an early agreement that will be satisfactory in the light of definitely changed conditions. One of the leading interests in the Abitibi Co. stated that the possibilities of the organization earning its bond interest and preferred dividends by a margin are very real with newsprint at fifty dollars per ton and anything like capacity operations. Production of newsprint in the first seven months of this year was 162,495 tons or at the rate of 278,000 tons annually, whereas capacity of the mills of the company, excluding Espanola and Sturgeon Falls, is 558,000 annually. The suggestion that five per cent preferred stock be given bondholders in lieu of bonds held and accrued interest would raise the annual amount of the new senior preferred obligation to $3,500,000 annually and any residue would go to build up the working position of the company, after which surplus earnings could be divided among the common shareholders, assuming that preferred and common shareholders would be give new common stock in exchange for their present holdings.

Findings in Trade Conspiracy Charges

Two true bill findings in indictments that charge conspiracy to restrain trade against several companies and individuals engaged in the manufacture of containers and materials used in their production were returned to Chief Justice Rose, Toronto, by the Assize Grand Jury. Charged in the first indictment are H. J. Badden, Brompton Pulp and Paper Company; Gair Company, Canada, Ltd.; Hinde & Dauch Paper Company of Canada, Limited; and Bathurst Power and Paper Company, Ltd.

The charge against these concerns is that they did unlawfully conspire, agree and arrange together with Dominion Boxboards, Limited, to unduly prevent or lessen competition in the cities of Toronto, Montreal, and other places throughout Canada where the articles or commodities mentioned are sold in the production, manufacture, etc., of articles which may be the subject of trade or commerce, in kraft liner board, test liner board, corrugating and other materials used in the manufacture of shipping containers, and did thereby commit an indictable offence contrary to the provisions of the Criminal Code. In the same indictment they are charged with conspiring to restrain or injure trade and unduly limit the facilities for producing, etc.

In the second indictment the companies and persons named are charged with restraint of trade in Toronto, Peterboro, London, Hamilton, Waterloo, Montreal and western cities. The list in the second indictment consists of Container Materials, Limited; H. J. Badden, Shipping Containers, Limited; Standard Paper Box Company, Limited; Martin Hewitt Container, Limited; Canadian Wire Bound Boxes, Corrugated Paper Box Company; Gair Company; Hinde & Dauch Company; Hygrade Corrugated Products, Hilton Bros., Limited; Martin Paper Products; Maritime Paper Products; Wilson Boxes; Dominion Corrugated Paper; Acme Paper Company; G. W. Hendershott, Corrugated Paper Company; Kraft Container and Superior Box Company. All these firms are charged with conspiring with Concord Shipping Cartons, Fibre Boxes, Firstbrook Boxes, Corrugating and Container Company, London Shipping Containers, Canadian Containers, A. W. Augustine; Building Products, Julius Irving Oelbaum and Pacific Mills.

Lake Sulphite Shares Treble in Value

The shares of the Lake Sulphite Pulp Company, Red Rock, Ont., which went into liquidation many months ago have trebled in value since the war began. Persons who are investing in them believe in the possibility of the plant being completed and going into operation. Plans to this end are now reported to be under way. The underlying situation has undergone a marked change for the better including firmer prices in important markets and restrictions in shipments from other sources of world supply. It is believed in view of the more promising outlook that the former difficulty in financing the completion of the plant will be largely removed. Once reorganization is carried out it would take about six months

to place the plant in condition to produce. It is understood that initially the company will turn out unbleached sulphite only. Some $150,000 of additional capital, it has been estimated, would be needed to bring the plant into production.

Hinde & Dauch Report Better Business

The Hinde & Dauch Paper Company of Canada, Toronto, report considerable improvement in the container business during the last few weeks and the plant is now operating at a high rate of capacity. Like many other businesses, prices have changed in certain lines. Kraft liner board selling price has moved up eleven per cent by the firm while straw board for corrugating purposes is up about twelve per cent. This is the first reversal in the downward trend of prices in the container industry in Canada for about two years. Both container manufacturers and suppliers of materials are protecting themselves by refusing to quote prices for future delivery. A factor is said to be the rapid rise in waste material since the outbreak of war. In spite of low levels of prices prevailing for many months in the paper container industry, Hinde & Dauch are reported not to have been losing money. Last year Hinde & Dauch earned $1.42 a share on its common stock. This year the annual dividend was reduced by one half to fifty cents a share, following continued price cuts.

Demand for Paper Rags Increases

Conditions in Europe has brought about an increased demand for all grades of cotton cuttings in domestic rags with an augmented price. So far there have been no changes in old waste paper prices. The market is, however, much firmer and waste paper is not plentiful. Toronto dealers are expecting an advance any day to follow increases already in effect in the United States market. In the pulp arena prices are stiffening on ground wood and sulphite both bleached and unbleached. The future is uncertain as is also delivery. The pulp mills like the paper mills are speeding up and have orders ahead for some time. In ground-wood pulp several spot sales are reported considerably above the figure that has been prevailing for some time. Paper buying has now steadied down and mills in all lines with the exception of newsprint, will take orders at the price prevailing at time of shipping and no long contracts are being entered into. The mills are not certain about the price and securing certain raw materials, rates of exchange, etc., and have to protect themselves. There is no disposition in the industry to profiteering and courage and confidence are strongly advocated.

Kalamazoo Superintendents Meet

KALAMAZOO, Mich., September 22, 1939—Lester H. La Liberte of the Kalamazoo Vegetable Parchment Company was elected chairman of the Michigan Division of the Superintendent's Association, at their first fall meeting of the new season, held at the Park American Hotel September 21. Arnold Weller of the Sutherland Paper Company and Henry Nendorf of the Rex Paper Company were elected first and second vice-chairman with Al Perlick reelected secretary-treasurer. Fifty attended the dinner meeting. Retiring chairman Ray Barton thanked all the committee chairmen for their co-operation in making his administration a success. National secretary Bob Eminger came up from Miamisburg, Ohio, to attend the meeting.

Two speakers were on the program, Douglas Robbins, president of Douglas Robbins & Company of Middletown, Ohio and Ezra Clark, president of the Clark-Truc. Tractor Company of Battle Creek, Mich.

Mr. Robbins' subjects were the Vortrap and Lignalloy suction box covers, two products which his company handles.

Mr. Clark explained in detail a tractor which his company has developed specifically for the unloading of pulp bales from railroad cars.

Both gentlemen delivered interesting and instructive talks on their subjects, which held the attention of their listeners.

Those present at the meeting were H. M. Faber, Sherwin Williams Company; A. W. Cole, Rex Paper Company; F. L. Zellers, past national president; R. L. Eminger, national secretary; L. H. La Liberte, Kalamazoo Vegetable Parchment Company; Arnold Weller, Sutherland Paper Company; A. L. Perlick, secretary-treasurer; R. L. Barton, Michigan Paper Company; Douglas Robbins, Middletown, Ohio; Everett Sharr, Clark-Truc. Tractor Company; Ezra Clark, Clark-Truc. Tractor Company; W. C. Hurley, Waterbury Felt Company; C. "Baldy" Smith, Huron Milling Company; A. B. Milham, Bryant Paper Company; J. A. Wise, Kalamazoo Paper Company; R. B. Stewart, Kalamazoo Vegetable Parchment Company; L. J. Scheid, Watervliet Pajer Company; W. J. Plank, Appleton, Wis.; H. E. Stafford, retired; William Wessel; R. P. Aument, American Box Board Company; J. L. Russel, Bryant Paper Company; R. T. Mashbury, Hercules Powder Company; George C. Schmidt and M. S. Fogarty, Michigan Paper Company; P. F. Neuman, Hercules Powder Company; A. E. Fuller, McClaskey Company; H. C. Pearson, Pioneer Paper Stock Company; Henry Nendorf, Rex Paper Company; R. W. Holden, Stowe Woodward Company; W. M. Bain, Glidden Company; W. H. Astle, Michigan Paper Company; H. S. Faram, Watervliet Paper Company; N. J. Cowie, Hawthorne Paper Company; H. C. Bradford, Rex Paper Company; W. B. Hadley, Sutherland Paper Company; J. Sisson, Clem Sisson and W. J. Wolfe, Mac Sim Bar Paper Company; Al Sherwood, Sutherland Paper Company; H. F. Kleinman, Hercules Powder Company; Paul de Guebery, Michigan Paper Company; Henry Reeves, Jr., Hercules Powder Company; J. O. Logan, Mathieson Alkalia Company; Otto Fischer, Bryant Paper Company and H. E. Stratton, PAPER TRADE JOURNAL.

Collins Employees Honored

The A. M. Collins Manufacturing Company, 226 Columbia avenue, Philadelphia, Pa., gave a luncheon on September 23 in honor of the retirement of S. R. Bradly who has served 57 years with the company, and William Levick who retires after a connection of 61 years. Frederick E. Macy, president of the company, presented momentoes to the retiring employees.

Financial News of Pulp and Paper Industry

Masonite Shows Increased Net Profit — Bagley & Sewall Assessment Reduced — A.P.W. Losses Decrease — Westminster To Call In All Bonds — Products of the Scott Paper Co. Discussed At Saturday Sales Meeting.

New York Stock Exchange

High, Low and Last for the Week Ending September 27, 1939

	High	Low	Last
A. P. W.	3⅝	3⅜	3⅜
Armstrong Cork Co.	39	37	38½
Celotex Corp.	11⅝	9⅞	11¼
Celotex Corp., pf.	61	60	60
Certain-Teed Products Corp.	8	6¾	7¾
Certain-Teed Products Corp., pf.	31¾	26¾	28½
Champion Paper & Fibre Co.	29⅞	26⅞	28½
Champion Paper & Fibre Co., pf.	100	98½	98½
Congoleum-Nairn Co.	22½	21½	22½
Container Corp. of America	16¼	14¾	16
Continental-Diamond Fibre Co.	9⅜	7½	8¼
Crown-Zellerbach Co.	16¼	15	15¾
Crown-Zellerbach Co., pf.	90	86½	89
Flintkote Co.	18⅜	17⅜	18
Robert Gair	5⅞	4⅝	5⅜
Robert Gair, pf.	17¾	13	16¾
International Paper & Power	14¼	12⅜	13⅞
International Paper & Power, pf.	51¼	43¼	50
Johns-Manville Corp.	82⅛	77½	77½
Kimberly Clark Corp.	37½	34	37½
MacAndrews & Forbes	29	28½	28½
Masonite Corp.	35¾	33	35¼
Mead Corp.	14⅜	13	13¾
Mead Corp., pf., 5½	60	56	60
Paraffine Companies, Inc.	40¼	39¾	40
Ruberoid Co.	20½	19½	20⅛
Scott Paper Co.	46¾	46½	46½
Scott Paper Co., pf.	110¼	110¼	110¼
Sutherland Paper Co.	26¾	24½	26¾
Union Bag & Paper Corp.	12¾	11⅛	12⅝
United Paperboard Co.	7⅝	6⅜	7¼
U. S. Gypsum Co.	74	70⅜	73½
U. S. Gypsum Co., pf.	154	153½	154

New York Curb Exchange

High, Low and Last for the Week Ending September 27, 1939

	High	Low	Last
American Box Board Co.	9⅛	7⅞	9
Brown Co., pf.	24½	17	23
Great Northern Paper	43¼	43¼	43¼
St. Regis Paper Co.	4⅛	3⅝	4
St. Regis Paper Co., pf.	61	56	61
Taggart Corp.	5	4½	4⅞

Masonite Profits Up 33.6 Per Cent

In the final quarter of its fiscal year the Masonite Corporation, manufacturers of boards for insulation and other building materials, had a net profit of $461,746, an increase of 33.6 per cent over the net earnings for the same period a year ago.

After provision for preferred dividend requirements the earnings were equal to 82 cents a share on 539,210 common shares and compare with 61 cents a share for the corresponding quarter last year of $345,651.

Net earnings for the year ended on August 31 amounted to $1,163,050 after taxes and other charges, equal to $1.99 a common share after preferred dividend deductions. In the preceding fiscal year earnings were $1,144,274, or $1.96 a common share.

Net sales of $7,313,012 in the last fiscal year were 20 per cent above.

Bagley & Sewall Taxes Reduced

[FROM OUR REGULAR CORRESPONDENT]

WATERTOWN, N. Y., September 25, 1939—Announcement is made here that the assessment value of $572,030 placed on the property of the Bagley & Sewall Company has been reducted $172,000 to a new total of $400,000. The company sought a reduction of $250,000 on its 22 pieces of property in the city and the revision amounts to about 31 per cent. The largest reduction was on Pearl Street where the property valued at $200,000 was reduced about fifty per cent. Other parcel reductions ranged from $80 to $50,000.

Prospects for an early resumption of operations at the idle Malone Paper Mill, recently acquired by the Bagley & Sewall Company are bright inasmuch as negotiations are reported under way with parties interested in the manufacture of cigarette papers. A representative of the local concern is conferring in New York City with the cigarette paper interests and it is possible that new equipment may be added to the mill. The parties seeking a lease of the mill are said to desire two of the smaller machines rather than the large one previously in use at the plant and the latter has been disposed of.

A. P. W. Loses $130,193

The A. P. W. Paper Company, Inc. for the year to June 30, report a net loss of $130,193, compared with $252,580 loss in preceding fiscal year. No provision was made for contingent loss on purchase commitments in either year. Current assets as of June 30, 1939, including $62,688 cash, amounted to $923,136, and current liabilities, were $369,065, compared with cash of $92,665, current assets of $963,945 and current liabilities of $375,384 at end of preceding year. Deficit from operations was $3,554, against earned surplus of $106,733. Funded debt on June 30, last, amounted to $3,408,583, compared with $3,464,712 at end of preceding year.

Westminster To Call in All Bonds

[FROM OUR REGULAR CORRESPONDENT]

VANCOUVER, B. C., September 22, 1939—According to announcement by J. J. Herb, president, the Westminster Paper Company of New Westminster B. C. has completed arrangements whereby it will be able to call all outstanding bonds at 103 on April 1, 1940. The company expects to break all records this year for volume of business and earnings. In the fiscal year ended January 31, 1939 net profit after depreciation was reported at $87,946, or $1.84 per share.

Discuss Scott Paper Co. Products

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., September 25, 1939—Products of the Scott Paper Company, Chester, Pa., were discussed at a sales meeting at the office of Carter, Rice & Co., Corporation, Saturday morning at 8 o'clock. Earl H. Wilgus, industrial sales manager, and William R. Draper, retail sales manager, of the Boston office of the Scott company represented that concern, while Frank H. Winter, sales manager of the Carter Rice Company, presided.

N. P. T. A. HOLD FALL MEETING AT CHICAGO

(Continued from page 9)

cerned, there is ample production capacity to take care of any anticipated real consumption. At the operating rates of the year to date, well over 2,000,000 tons of capacity is idle. We have a reasonably safe margin between consumption and capacity.

"But a temporary flurry in demand is quite another matter. Rush to cover, outright speculation, foolish duplication of orders; these and many other symptoms of panicky thinking can create for a surprisingly long period an apparent shortage. This, in turn, as all of us very well know, can build up to towering heights before it falls. And it will fall; that we all know from bitter experience.

"Before war was declared paper manufacturers expected a substantial increase in sales volume this Fall. Consumption had outrun production for a relatively long period. Stocks were low. Those who had sold paper short were reaching the point where they had to cover. We expected an increase that would lift our production ratios—perhaps, up into the critical range where price movements begin. That we expected even prior to the market condition precipitated by the outbreak of war in Europe.

"The business reaction in the United States since September emphatically indicates that on top of a high normal level, we are likely to have an additional demand. Anything that stimulates general business, immediately adds to paper consumption. Looking further, we can easily see substantial growth in paper exports to Central and South America. The coming of this business is not idle speculation; orders are already coming in.

"The sum total of these demand factors makes a fine prospect for sales volume. The previously anticipated demand plus the expected increases due to the war will reduce substantially the availability of idle capacity. But the industry is eminently able to meet it all. I want to emphasize the fact, however, that in doing so the margins will be narrowed and that if speculation enters the picture in a large way, the reactions are likely to be as extraordinarily sharp now as they were in 1918 to 1920.

"A third fact is that not only because of volume but also because of direct increases in costs, due to war commodities, prices must inevitably move upward. These movements are likely to take different patterns in different grades and their timing will not be the same. Already material quotations show increases. Some of them are substantial. Because some of our materials are used directly for war purposes, and because they are handled extensively in international trade, further price changes can be expected if and as the war develops. Obviously, these must be offset by increases in paper prices.

"Now, gentlemen, let us stop with these relatively simple facts. They are enough, it seems to me, to indicate to both manufacturers and merchants, the essential difference between a sane and a foolish approach to this whole performance. They are enough to emphasize the necessity for sound, sober thought.

"They tell us simply this: that if we take this thing in stride, we can, all of us, make orderly adjustments as they become necessary and we can maintain a position which will not hurt too much in the unwinding process. They also tell us this: that we can create, by speculating in materials and in finished products, a series of crises in which all of us are bound to be hurt.

"Between these alternatives, there can be no choice, nor can there be compromise. The dictates of common sense demand calm evaluation, orderly adjustment and constant consideration of the unwinding process.

"Those of us who went through the 1918 to 1920 period know what happens in the final wind up of a war. It is mighty easy to go up in a balloon of speculation and rising prices, but it is mighty difficult to get down to earth again without getting injured. Having had one experience with outrageous speculation and remembering we have ample capacity for any reasonable increase in consumption, let us not be run off our feet in the purchase of raw materials on the part of mills or finished paper on the part of merchants. Outguessing this war business is a difficult job. It will not be a question of making more money in this industry but of hanging on to what you have now. When the parachute drops let us be prepared for it through sensible cooperation between mills and customers."

Importance of Constructive Selling Discussed

On the morning of September 19 the Wrapping Paper Division continued the selling theme with the "Sales Department" as the subject for discussion. An address by T. Russ Hill, president of Rexaire, Inc., of Detroit on "New Influences in Selling" further stressed the importance of constructive selling with less "high pressure" and more information concerning the product and its uses.

Further than the appearance of these two speakers the paper industry did not go, choosing to develop its program among its own members and providing a system of forum discussion on selling, salemanship and the basic problems of the N.T.P.A. A discussion of Commodity lines featured the opening Wrapping Paper Division meeting with the following gentlemen reporting: Wrapping Papers, E. P. Magel; Bags, E. Wesselmann; Tissue, R. M. Stone; Gummed Tape, C. H. Schorske; Specialties, A. D. Riley; Twine, T. Floyd Smith. During the same period the Fine Paper division discussed its mid-year survey and distribution trends with the present day European situation actually tending to monopolize this as well as other discussions of sales trends and future possibilities.

A most important conference of local Secretaries and Executives with the National Counsel, held early in the week, served to project the importance of the local unit in preserving a measure of calmness and in developing the paper industry on a sound basis in this time of crisis, as well as an important factor in an interchange of information.

Fine and Wrapping Paper Divisions Meet

The Wrapping Paper Division, with Vice President C. E. Roach presiding, and the Fine and Wrapping Paper Divisions in joint session with the president, F. T. Jamison presiding, took most of the afternoon and evening of September 19 to consolidate various suggestions made and to again urge united effort in an approach to present day selling problems.

The Fine Paper division met on the morning of

September 20 to hear B. E. Reeves, chairman of the Book Paper Committee, give an interesting discussion of the present conditions in that industry.

The semi-annual meeting on September 20 was reported as one of the most outstanding and significant held by the industry. Remarks by President Jamison and the reports of the board, of the treasurer, the executive secretary, the traffic committee and other groups within the Association were all strongly tinted with the atmosphere of emergency which pervaded the entire session. Out of the discussion again came the urge to individual members of the industry to work closely with the Association in bringing order out of any possible chaos. There also came the appeal to remember that while prices might sky rocket upward there was always the havoc created when the market came down.

Other Special Meetings Held

Aside from the regular program at least two other specially arranged meetings were held during the week. The Paper and Twine Club, with popular President Earl Beier presiding, again evidenced why it is so successful in developing greater friendships between the various paper executives by staging an interesting noon luncheon featured by the entertainment efforts of Saw Playing Sisson and the Maple City Four. The speaker, J. T. Meek, urged the paper industry to get its own house in order, to justify the confidence that had been imposed upon it and to share, with all industry, the duty of protecting business against possible regimentation of industry during the present crisis.

The Salesmen's Association of the Paper Industry, favored with perfect fall weather, collected 150 salesmen, guests and executives from all parts of the country to enjoy the annual golf outing held at the Olympia Fields Country Club on September 21. The attendance was a tribute to the hard work expended by Chairman George Crafts of the midwest division.

Fifty Exhibits Occupy Space in Hotel

The Exhibit Committee did a splendid job of handling this increasing important division of activity. Approximately fifty concerns utilized the exhibit space in the Stevens Hotel, space actually reserved for concentrated exhibition purposes.

The exhibits ranged from the popular Mosinee Towel Sales Carnival which provided a combination of "facts, fun and entertainment" to the forum on packing problems conducted by Better Packages, Inc. The Fox River Paper Corporation provided a football schedule for the more sporting element among its visitors while Sherman Paper Products distributed "my little red note book" to its guests. The exhibitors were given the benefit of an official directory of all displays on the fifth and sixth floor, a directory which also included the name of those executives in charge of the exhibits and a description of the lines and exhibits.

Space does not permit a more detailed description of the program arranged by President F. T. Jamison, vice presidents P. W. Lesh and C. E. Roach and executive secretary A. H. Chamberlain.

Perhaps the most significant statement coming from the Chicago meeting was that of Mr. Chamberlain who said that "no one in any industry can approach the present-day outlook single handed and alone. He must enjoy the benefit of all the wisdom and experience that can be collected and must contribute his share."

It was an inspired meeting, a fortunate "break" for the industry that its leaders were in executive session at a time when unnatural causes are materially affecting its conduct and its future. That the meeting was handled so well must remain a tribute not only to those who arranged it but to those participants who seem to definitely realize that the challenge to the paper industry will force the N.P.T.A. to use every weapon at hand to protect itself against the critics of business.

Government Paper Bids

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., September 27, 1939—The Government Printing Office has received the following bids for 21,630 pounds (70,000 sheets) of 28 x 34 high finish sulphite manila tag board: Paper Corp. of U. S., 5.64 cents; Barton, Duer & Koch Paper Company, 5.44 cents; Whitaker Paper Company, 4.82 cents.

For 6,700 pounds of 38 x 48 blue M.F. book paper: Standard Paper Company, 8.95 cents.

For 10,000 pounds of standard newsprint paper in 52¾ rolls: Stanford Paper Company, $37.50 per ton.

For 150,000 pounds of standard newsprint paper in 48 inch rolls and 40,000 pounds same in 24 inch rolls: National Pulp and Paper Company, 2.5 cents; and Paper Corp. of U. S. at 3 cents.

For 5,000 pounds of oiled manila tympan paper in 38 inch rolls; Link Paper Company, 7.5 cents; Cromwell Paper Company, 7.75 cents; R. P. Andrews Paper Company, 7.75 cents; and Mathers-Lamm Paper Company, 8 cents.

For 106,200 pounds of 27½ x 39 M.F. book paper: R. P. Andrews Paper Company, 4.37 cents; Mudge Paper Company, 5.13 cents; Cauthorne Paper Company, Inc., 4.92 cents; Whitaker Paper Company, 4.88 cents; Fitchburg Paper Company, 5.38 cents; Stanford Paper Company, 4.87 cents; Barton, Duer & Koch Paper Company, 5.38 cents; and Paper Corp. of U. S., 4.65 cents.

Rittenhouse Association Meets

[FROM OUR REGULAR CORRESPONDENT]

PHILADELPHIA, Pa., September 25, 1939—The Rittenhouse Paper Salesmen's Association held its executive meeting on Friday last at Dufor's Restaurant, at which time new officers were elected for the ensuing year. Harold Robinson of Whiting-Patterson, was re-elected to the presidency; H. Larry Leatherman of Thos. Price Company, vice-president; Thomas McIntyre, Schuylkill Paper Company, secretary; S. T. Vance, Raymond & McNutt, treasurer. Hugh L. Monaghan, Wilcox-Walter-Furlong Paper Company, was appointed chairman of publicity, and Al. Snowden of D. L. Ward Company, was appointed chairman in charge of the general meeting to be held Monday, October 9, to be known as Executives' Night, so called because a senior executive of each of the paper houses is invited as a guest of the Rittenhouse Paper Salesmen's Association, at a dinner to be held at 6 o'clock in Kuglers. A resumé of past activities will be given and plans for the future will be formulated.

Instrumentation Studies. XXXII.

The Measurement of Compressibility of Paper Under Static Load

By The Staff of The Institute of Paper Chemistry

Abstract

A compressibility gauge has been designed which will give reproducible measurements of paper thickness under pressures up to 100 pounds per square inch that are accurate to ± 0.00002 inch. These results can be reproduced by several operators.

There are significant differences in compressibility, expressed as percentage of thickness of the paper, between the different grades of paper and between some of the papers within a given grade.

In at least one case, practical trial printing tests have indicated that differences in compressibility may be responsible for variations in printability. However, these printing tests are far too meager to give a valid conclusion.

The property of compressibility bears an important relationship to the printability of paper; the more compressible the high spots in the sheet surface, the more complete is the contact between the paper surface and the printing plate. This relation is discussed in Instrumentation Studies XXIII,[1] "The Measurement of Elasticity and Compressibility by the Bekk Hardness Tester." It must be remembered that compressibility is only one of the properties influencing printability, and that it is, in reality, a component of printing smoothness (the smoothness of the paper surface which is in contact with the printing plate under printing pressure).

In Instrumentation Studies XXIII a method of measuring compressibility was discussed and its weaknesses pointed out. An attempt was made to measure compressibility under static load, using a thickness gauge of the normal design so modified as to allow a variation of the pressure on the sheet during the measurement. The results showed that the normal gauge did not give the required degree of sensitivity and reproducibility. The present report discusses the development of a gauge for this particular purpose and the measurement of the compressibility of typical papers of several grades. The assistance of the Federal Products Corporation, Providence, Rhode Island, in the design and manufacture of the gauge is gratefully acknowledged.

[1] *Paper Trade J.* 106, no. 2:42-47 (Jan. 13, 1938).

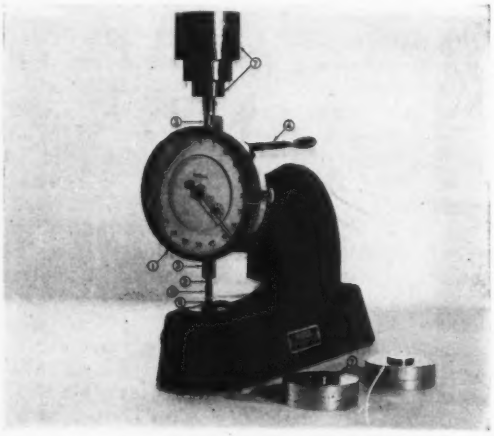


FIG. 1
Federal Compressibility Gauge

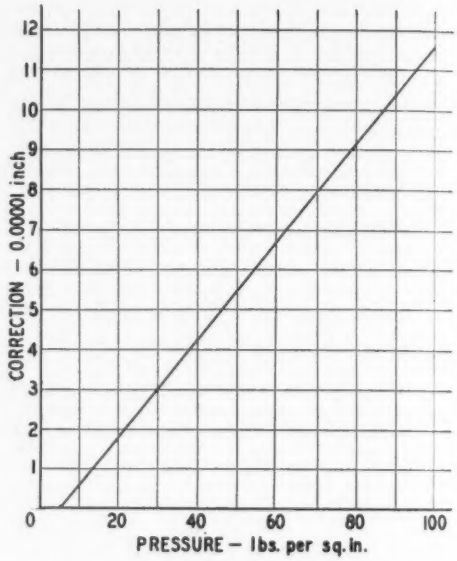


FIG. 2
Correction for Deflection of Gauge Spindle

Compressibility Gauge

The thickness gauge used is shown in Fig. 1. It was built on the basic design of Federal Products Corporation gauge No. 691. The design was modified for this work by replacing the normal indicator with one that was graduated to 0.00005 inch, the readings of which could be estimated accurately to ± 0.00001 inch. The diameter of the spindle foot was reduced to 5 mm. and a series of weights were made which could be attached to the top of the spindle, and which could produce pressures on the area of paper between the anvil and the spindle foot capable of being varied in 5-pound steps from 5 to 100. The weights were designed for rapid and positive centering on the spindle top. The bottom weight fits the spindle top. The top of this weight and each successive weight has a shallow recess in which fits a centered pin on the bottom of the next weight above.

Before proceeding with measurements on paper the instrument was carefully checked for accuracy. The surfaces of the spindle foot and anvil were checked for parallelism. The faces were found to be parallel when tested by TAPPI Standard Method T 411 m-36. The area of the foot and the weight of each individual weight were also carefully checked. Slight errors were found in the area and in some of the weights. In tabulating and plotting results used in this report, corrections were made for these.

A serious discrepancy in results was found to be caused by a variation in the deflection of the gauge spindle when different weights were used on the spindle. With the spindle foot resting on the anvil surface and no paper between, it was found that increasing the weight on the spindle caused a decreasing reading on the gauge dial. It was concluded that this was due to a slight bending of the spindle. However, it was possible to establish an accurate correction curve for this error. This was done by carrying out measurements with the whole series of weights, both with the foot resting on the anvil and with standard thickness feeler gauges of 0.0015, 0.002, 0.003, 0.004, and 0.006 inch between the foot and anvil. The error was found to be constant for this range of thicknesses. The correction curve is given in Fig. 2; this curve was checked by repeated tests with different operators and was found to be accurate to within ± 0.00002 inch. The necessary corrections have been applied to all results used in this report. It is believed that the gauge can readily be redesigned to eliminate the deflection of the spindle and the necessity of this correction.

Because of the high sensitivity of the instrument, the readings are affected by slight vibrations; therefore the instrument must be mounted on a support free from such vibrations. Considerable care was required in releasing the weight of the spindle onto the paper in a manner that could be reproduced and which would cause errors in readings due to a slight friction between the moving parts. The following procedure was found to be satisfactory and was used for the results reported herein. Starting with the smallest weight on the spindle (equivalent to 5.5 lb./sq. in. on sample) the spindle was slowly lowered from about 0.001 inch above the thickness of the paper. After the spindle lever was entirely released, the table on which the gauge rested was lightly tapped. This slight vibration released any friction and brought the pointer to a reproducible reading. Each weight was added in such a way as to avoid any excessive compression of the paper. This procedure was followed through the scale of increasing pressures to the maximum and then the operation was repeated with decreasing weights down to 5.5 pounds per square inch.

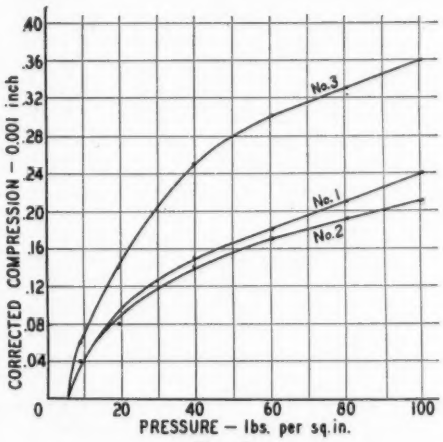


FIG. 3
Compression vs. Pressure
Supercalendered Book

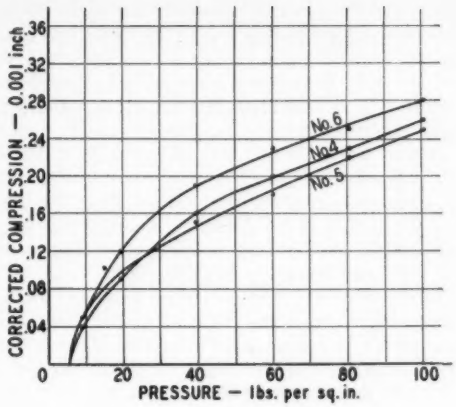


FIG. 4
Compression vs. Pressure
English Finish Book

Experimental Work

In order to check the reproducibility of results by different operators, eight samples of book papers were measured by two operators working independently. Ten separate series of readings were made on ten different spots in the paper. In each series the following pressures were used: 5.7, 9.0, 19.3, 39.7, 60.1, 80.5, and 100.5, first in the ascending order and then in the descending order. Table I gives the results in terms of compression (expressed as 0.00001 of an inch) corrected for deflection by use of the previously determined correction values. The maximum difference between the two operators at any individual reading on any paper was 0.00003 inch. This difference is approximately equivalent to the reproducibility in reading the gauge indicator and represents exceptionally good checks.

As would be expected, there is a marked hysteresis in thickness changes as the pressure of calipering is decreased after having been at the maximum. It will be noticed that all papers fail to return to their

TABLE I.—COMPRESSION—CORRECTED—0.00001 INCH
(Reproducibility of Results by Two Operators)

No.	Sample Description	Thickness 0.001 in.	Operator	Caliper Pressure—Pounds per square inch												
				5.7	9.0	19.3	39.7	60.1	80.5	100.5	80.5	60.1	39.7	19.3	9.0	5.7
1	Supercalendered Book	3.1	A	0	4	9	15	19	22	24	23	20	18	13	10	8
			B	0	3	7	14	17	20	23	21	18	16	11	8	6
2	Supercalendered Book	2.8	A	0	3	8	14	17	19	19	19	18	17	12	9	7
			B	0	4	7	14	16	19	22	20	18	16	12	9	8
3	Supercalendered Book	2.9	A	0	6	15	26	30	32	34	33	31	30	23	17	14
			B	0	5	13	23	29	33	37	34	32	28	21	15	12
4	English Finish Book	3.4	A	0	3	8	15	20	23	25	25	22	19	14	10	9
			B	0	4	8	16	19	23	26	25	20	19	14	11	8
5	English Finish Book	3.5	A	0	5	9	15	19	22	24	23	21	18	14	10	9
			B	0	4	8	15	17	21	25	22	19	17	14	9	8
6	English Finish Book	3.3	A	0	6	13	20	24	27	28	28	26	24	20	15	13
			B	0	4	10	18	21	23	28	23	21	20	16	12	10
7	Machine Finish Book	3.1	A	0	7	17	28	33	37	40	39	36	33	26	20	16
			B	0	6	15	26	31	35	38	37	33	30	23	18	14
8	Machine Finish Book	3.2	A	0	7	16	27	31	36	40	38	33	30	25	19	15
			B	0	6	14	24	29	34	38	35	32	29	23	16	13

original thickness at 5.7 pounds per square inch. In the work covered in this report, however, no information of practical significance was obtained from the readings with decreasing pressures; therefore, such readings will not be reported for other papers tested.

The compressibilities under increasing pressures are plotted for these papers in Figs. 3, 4, and 5. These show, as do most of the results reported, that the differences in compressibility increase as the pressure of calipering is increased and that, in the case of the E. F. books, the sample (10924) that has a significantly different compressibility does not show the difference until 40 pounds pressure is reached.

From these results it would appear that it is not necessary to take a complete curve but that readings at 9 pounds and at one other pressure in the range of 40-100 pounds would be sufficient for practical purposes. The plotted results in these three figures show that there are papers in the same grade which have a significant difference in compressibility.

The three grades rank super, E. F., and M. F., in order of increasing compressibility as would be expected; however, there is one super paper that has a compressibility approximately equal to that of the two M. F. papers tested and an E. F. that is as low as a super in compressibility. A check indicates that the finishes of all papers within a grade are very close.

Several additional book papers, as well as samples of other grades, have been tested and the results are given in Table II. Rather than express these compression results in fractions of an inch, they have been expressed as percentage of the thickness of the paper. The caliper at 5.7 pounds per square inch was used as the thickness of the sheet. This method of expression tends to eliminate sheet thickness as a factor in the measurement and makes it a more direct measure of the properties of sheet structure. It has been suggested that compressibility is principally a function of sheet density; however, the results obtained on several of the book papers, on which densities were calculated, indicated clearly that this was not the case. From the results in Table II it can be seen that compressibility must be influenced by factors other than caliper and density.

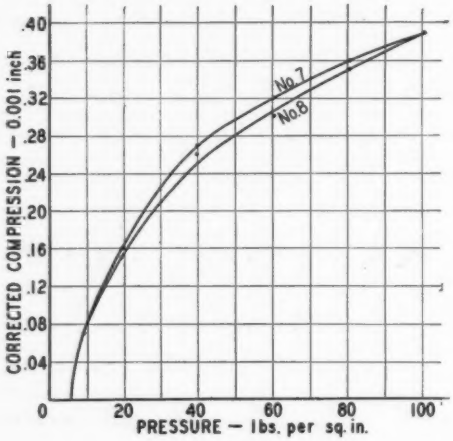


FIG. 5
Compression vs. Pressure
Machine Finish Book

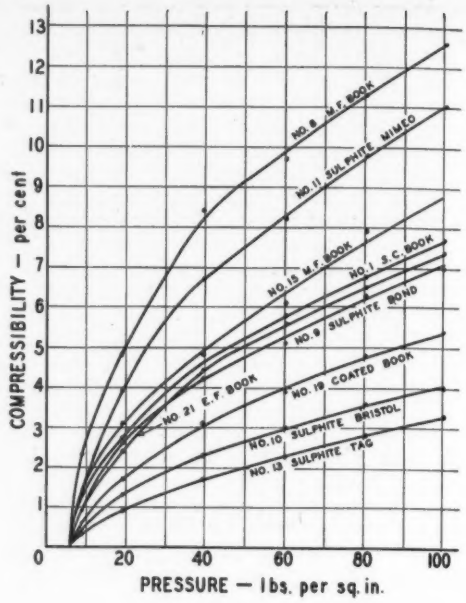


FIG. 6
Compressibility of Typical Papers

The compressibilities of several of the papers are plotted in Fig. 6 to show graphically the compression with increasing pressure. It is seen that all papers follow much the same form of curve and that the value at any pressure between 20 and 100 pounds per square inch is an indication of the relative compressibility.

In some of the later measurements, the thicknesses taken at 5.5 pounds per square inch pressure appeared out of line when compared with those meas-

TABLE II.—COMPRESSIBILITY—PERCENTAGE OF CALIPER

No.	Sample Description	Thickness 0.001 in.	Pressure—Pounds per square inch 5.7	9.0	19.3	39.7	60.1	80.5	100.5
9	Sulphite Bond 20 lb.	4.3	0	0.9	2.6	4.4	5.1	6.3	7.0
10	Sulphite Bristol—Fourdrinier	9.0	0	0.4	1.3	2.3	3.0	3.6	4.0
11	Sulphite Mimeo 20 lb.	4.9	0	1.4	3.9	6.7	8.2	9.8	11.0
12	Sulphite Bristol—Cylinder	11.2	0	0.5	1.4	2.7	3.7	4.4	5.2
13	Sulphite Tag—Cylinder	16.6	0	0.3	0.9	1.7	2.3	2.8	3.3
14	Glassine 25 lb.	1.4	0	1.4	2.1	3.6	4.3	5.7	7.1
15	M.F. Book 50 lb.	2.9	0	1.4	3.1	4.8	6.2	7.9	8.6
7	M.F. Book 50 lb.	3.1	0	2.3	5.2	8.7	10.3	11.6	12.6
8	M.F. Book 50 lb.	3.1	0	2.3	4.8	8.4	9.7	11.3	12.6
16	M.F. Book 60 lb.	3.3	0	1.5	3.0	5.2	5.8	7.0	7.9
4	E.F. Book A Grade—50 lb.	3.4	0	1.2	2.4	4.7	5.9	6.8	7.6
20	E.F. Book A Grade—50 lb.	3.2	0	1.3	2.2	3.8	4.4	5.0	5.9
21	E.F. Book A Grade—50 lb.	3.5	0	0.9	2.4	4.4	5.6	6.5	7.4
5	E.F. Book C Grade—50 lb.	3.5	0	1.4	2.3	4.3	5.1	6.0	6.9
6	E.F. Book E Grade—50 lb.	3.3	0	1.8	3.3	5.8	6.7	7.6	8.5
17	S.C. Book A Grade—50 lb.	3.5	0	1.1	2.3	3.7	4.6	5.1	6.0
1	S.C. Book A Grade—50 lb.	3.1	0	1.3	2.6	4.8	5.8	6.8	7.7
2	S.C. Book C Grade—50 lb.	2.8	0	1.4	2.9	5.0	6.1	6.8	7.5
3	S.C. Book E Grade—50 lb.	2.9	0	2.1	4.8	8.6	10.3	11.4	12.4
18	Coated Book	3.4	0	0.9	1.8	2.9	3.8	4.4	5.0
19	Coated Book	5.4	0	0.6	1.7	3.1	3.9	4.8	5.4

Top Press Roll

CANADA, ENGLAND, UNITED STATES

Cylindre de Pression Superieur

BELGIUM, FRANCE

Cilindro di Pressione Superiore

ITALY

Cylindro de Pressão Supérior

BRAZIL, PORTUGAL

Öfverste Tryckrolle

SWEDEN

Верхній Компрессор Валс

RUSSIA

上壓力筒

CHINA

Obere Presswalze

GERMANY, SWITZERLAND

Bovendrukwals

HOLLAND

Ο ΑΝΩ ΚΥΛΙΔΡΟΣ

GREECE

上壓展

JAPAN

Cilindro de Presion Superior

CHILE, MEXICO, SPAIN

Wierzchnie cylindry prasowe

POLAND

In any language **STONITE*** means better top press and smoothing roll performance. May we tell you why?

**[Ebonite and Granulated Stone Composite U.S. Patent 1,787,890 Re. 18,111]*

STOWE-WOODWARD, INC. NEWTON UPPER FALLS · MASS.

NEW YORK OFFICE · WOOLWORTH BLDG.

Stowe-Woodward Rolls are made on the West Coast by HUNTINGTON RUBBER MILLS, INC., Seattle, Washington

Makers of **WHITE STAR** *Rubber Covered Rolls,* **TANNITE** *Couch Rolls*
STONITE *Top Press and Smoothing Rolls—All by the* **COREWELD** *Process*

ured at 9.0 pounds per square inch; from this it was concluded that 5.5 pounds was an insufficient pressure to give an accurate thickness reading on all papers. Therefore, thickness was taken at 9.0 pounds pressure.

Samples were available for two cases of poor and good printing, under identical conditions, on the same grade of paper. The compressibility of these samples was measured and the results will be discussed for the individual cases.

In case one, two samples of 45-pound supercalendered groundwood-free book of the same grade and made in essentially the same way showed marked differences in printing. In one paper the solid grays and blacks in the half-tones were blotchy and mottled, while in the other they were quite uniform when run through the press in succession. The normal physical properties of these papers, such as gloss, smoothness, strength, stiffness, oil absorption, and apparent density showed no significant differences. From observation of the printing it appeared that some areas in the poor paper made better contact with the plate or took the ink more readily than other areas. The caliper at 9 pounds pressure and the percentage compressibility at 3 higher pressures are given below:

		Compressibility, per cent		
	Thickness 0.001 in.	39.7 lb.	60.1 lb.	100.5 lb.
Satisfactory printing.....	2.84	3.9	4.2	5.3
Unsatisfactory printing..	2.79	3.3	3.9	4.3

The lower compressibility in the case of the unsatisfactory paper would appear significant and a possible cause of the nonuniformity of the printing.

In case two, two English finish papers, printed under identical conditions, gave varying degrees of distinctness of detail in the light portions of the half-tones. The printer rated these for quality of printing. When the printed areas were examined microscopically, it was seen that the differences were due to irregularities of half-tone dots, and, in the case of the poorer sample, the failure of some dots to print. These sheets were of different furnish composition and made by different mills. The thicknesses, and compressibilities of these samples are given below:

		Compressibility, per cent			
	Thickness 0.001 in.	19.3 lb.	39.7 lb.	60.1 lb.	100.5 lb.
Good printing.....	4.3	4.3	2.8	3.0	4.2
Poor printing.....	4.5	4.4	3.0	3.6	4.5

These data show that there is a slight difference in compressibility, the good printing sheet being the less compressible. It is evident that compressibility is not the factor causing the difference.

Summary

A compressibility gauge has been designed which will give reproducible measurements of paper thickness under pressures up to 100 pound per square inch that are accurate to ± 0.00002 inch. These results can be reproduced by several operators.

There are significant differences in compressibility, expressed as percentage of thickness of the paper, between the different grades of paper and between some of the papers within a given grade.

In at least one case, practical trial printing tests have indicated that differences in compressibility may be responsible for variations in printability. However, these printing tests are far too meager to give a valid conclusion.

Future work should be continued along two lines. The compressibility gauge should be redesigned to eliminate the necessity of correcting for deflection of the spindle, thus making the measurement simpler and less subject to error. Data should be accumulated through a large number of practical printing trials by taking compressibility measurements on similar samples which show good and inferior printing. These data should be supplemented by complete information on the other physical properties which are known to affect printability of the good and inferior sheets.

Congratulate Walker Goulard Plehn

New York, September 22, 1939.

Editor PAPER TRADE JOURNAL:

May we take this means to congratulate Walker Goulard Plehn Company for their splendid article, "How Does America Stand About Supplying Additional Orders in the Export Field?" appearing in your September 21st issue?

We feel that there is a lot of common sense to it, and we would certainly like to have those facts driven into the minds of the American mill executives who are already raising prices or "withdrawing from the market," creating a difficult situation for the exporter and his regular Latin American clientele.

Of course, we do not mean to be entirely one-sided in this matter and merely assume the viewpoint of the exporter who does not want to have his regular sources of supply raise prices unduly or abstain from filling orders altogether, but we do feel that this price raising and withdrawing from the market by American mills is due to a great extent—for the present, anyway—to a lot of nervousness and speculation, which only serves to disrupt the fine machinery of business and compels our customers in Latin America to trade with other countries. This situation naturally makes us lose regular accounts and causes our clientele to feel antagonistic towards American suppliers under the belief that if American suppliers fall down on them in times of stress, it means that their business is not so valuable after all, and the sooner they make other more steady connections, the better.

We reckon, of course, that we are all human, and that a situation like the present one is likely to get any one's nerves jittery, but certainly American mills can do something about remaining faithful to their regular purchasers in Latin America with a view of enjoying their goodwill in times when business at home is not so flourishing and export business to Latin America is a welcome outlet.

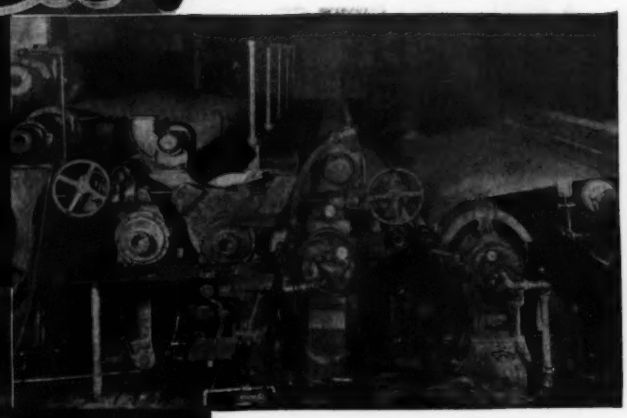
R. RIOS & CO., INC.

Continue $50 Newsprint Price

[FROM OUR REGULAR CORRESPONDENT]

TORONTO, Ont., September 25, 1939—The Abitibi Power and Paper Company, Limited, Toronto, which is in receivership, will continue its price of $50 per ton for newsprint for the first three months of 1940, it is learned from G. T. Clarkson, Toronto, who is receiver and manager of the company. This announcement follows a similar statement made a few days ago by the International Power and Paper Company. Great Lakes Paper Company, Fort William, Ont., is already committed, under its contracts, to sell "at the market price".

Improved!



BELOIT HORIZONTAL *Dual Press*

PATENTS PENDING

● The Beloit Horizontal Dual Press has been improved by incorporating a primary roll over the first suction press, adding another nip. Thus, this press is now equivalent to three presses instead of two, the first suction roll doing double duty.

● The success of the Beloit Horizontal Dual Press has been definitely established. This new press gives even better results.

THE BELOIT WAY BELOIT IRON WORKS PAPER MACH'Y BELOIT WIS **IS THE MODERN WAY**

BELOIT IRON WORKS BELOIT WISCONSIN

CONSTRUCTION NEWS

A Summary of Vital Facts Regarding Construction, Financing and Operation of Pulp and Paper Mills

General Construction News

Baltimore, Md.—The Chesapeake Paperboard Company, Key Highway and Baltimore & Ohio Railroad, manufacturer of coated and other paper board stocks, chip board, etc., has approved plans for expansion and improvements in mill, including installation of additional equipment for increased capacity, and work is being placed under way. Initial equipment will include a new breaker-beater unit, for which contract has been let to the Shartle Brothers Machine Company, Middletown, Ohio, new drying units, to be furnished by the Baker Manufacturing Company, Saratoga Springs, N. Y., and other machinery. It is proposed to construct additions to mill buildings in the near future, when further increase will be made in plant equipment and facilities.

Charleston, S. C.—The Rathborne, Hair & Ridgway Company, 1440 West 21st place, Chicago, Ill., manufacturer of wooden packing boxes and shipping cases, is planning for establishment of a new division for the production of paper boxes and containers of various kinds. Company is concluding arrangements with city officials at Charleston for lease of tract of about 36 acres of land for new plant for such manufacture, and will have plans prepared for initial buildings at early date. It will consist of several large production units for folding cartons, corrugated shipping containers and allied specialties, with power house and auxiliary structures, reported to cost over $400,000, with equipment.

Long Island City, New York, N. Y.—The Interstate Container Corporation, recently organized with capital of $150,000, plans operation of plant in Long Island City area for manufacturer of corrugated and other paper boxes and containers. New company is represented by Kotzen, Mann & Siegel, 51 Chambers street, New York, attorneys.

Menasha, Wis.—The Marathon Paper Mills Company, Rothschild, Wis., has awarded erection contract to the Permanent Construction Company, 2712 North Holton street, Milwaukee, Wis., for proposed new addition to branch mill at Menasha, previously referred to in these columns, used for production of waxed and other paper stocks, and work on superstructure will be placed under way at early date. It will be two-story and basement, 110 x 220 feet, reported to cost about $80,000, with equipment. Structural steel framing is being furnished by the Worden-Allen Company, West Capitol drive and North Third street, Milwaukee. Frank Gruper is company engineer in charge.

Seaford, Del.—E. I. duPont de Nemours & Company, Rayon Division, duPont Building, Wilmington, Del., has authorized plans for expansion in new synthetic fiber mill at Seaford, where initial mill for production of such material, known as "Nylon," is now in course of construction and scheduled for completion by close of this year. Present plant, as well, is being enlarged over estimated capacity by about 25 per cent, and will have an output of close to 7,000,000 pounds per annum. The new addition, on which work is scheduled to begin as soon as present mill is completed, will consist of several large units and will double, approximately, the initial capacity noted. It is reported to cost over $5,000,000 and will be carried to completion in 1940. Company engineering department, first noted address, is in charge of design and construction.

Chicago, Ill.—The Eastman Kodak Company, Kodak Park, Rochester, N. Y., manufacturer of photographic and other processed papers, films, etc., has awarded general contract to J. W. Snyder & Company, 307 North Michigan avenue, Chicago, for proposed new branch plant on Prairie avenue, near Seventeenth street, Chicago, previously referred to in these columns. It will be three-story and basement, 100 x 175 feet, reported to cost about $500,000, with equipment. Work is scheduled to be placed under way at once. Schmidt, Garden & Erikson, 104 South Michigan avenue, Chicago, are architects. Chicago offices of company are at 1727 South Indiana avenue.

Jacksonville, Fla.—The United States Gypsum Company, Evergreen avenue, manufacturer of wall board, plaster board and kindred products, has approved plans for one-story addition to local plant, to be used for storage and distributing service. Cost reported about $25,000, with equipment. Work will be placed under way at once. Main offices of company are at 300 West Adams street, Chicago, Ill.

New York, N. Y.—The Phoenix Box Corporation, organized with capital of 200 shares of stock, no par value, plans operation of local plant for production of paper boxes and folding cartons of various kinds. New company is represented by the Lawyers Albany Service, 305 Broadway, New York.

Greenville, S. C.—The Greenville Paper Stock Company, recently organized by D. H. Sher, Lindale avenue, Greenville, and associates, has plans maturing for new plant on local site on New Buncombe road, to be used for reclaiming waste paper stocks. It will be one-story, estimated to cost close to $25,000, with equipment. Erection is scheduled to begin at early date.

Chicago, Ill.—The Acme Paper and Supply Company, 184 West Washington street, commercial paper products, has arranged for lease of space in building at 106-10 West Lake street, known as Norman Building, and will occupy for company headquarters, with storage and distributing facilities. Company will remove to new location effective November 1.

Tama, Iowa—The Central Fibre Products Company, Inc., 111 West Washington street, Chicago, Ill., manufacturer of chip board, news board and kindred paper board products, has approved plans for new addition to mill at Tama, to be two-story, reported to cost close to $40,000, with equipment. Erection will be placed under way at once.

Baltimore, Ohio—The Fairfield Paper Company, manufacturer of corrugated paper board products, is arranging for resumption of operations at its Beaver Falls mill, effective October 2, following curtailment for some time past. Employment will be given to about 75 persons in different departments. It is expected to maintain regular production at mill for an indefinite period.

Toronto, Ont.—The National Cellulose of Canada, Ltd., Weston road and Clouston avenue, manufacturer of special tissue and other paper stocks, has approved plans for new one-story addition to mill, totaling about 10,000 quare feet of floor space. It will be used primarily for storage and distributing service, and is estimated to cost close to $25,000, with equipment.

New Companies

New York, N. Y.—The Swedish Paper Corporation has been incorporated with capital of 400 shares of stock, no par value, to deal in paper products of various kinds. New company is represented by Debevoise, Stevenson, Plimpton & Page, 20 Exchange place, New York, attorneys.

New York, N. Y.—Patent Containers, Inc., has been organized with capital of 200 shares of stock, no par value, to manufacture and deal in paper boxes and containers, folding cartons, etc. New company is represented by Fitelson & Mayers, 608 Fifth avenue, New York, attorneys.

New York, N. Y.—The DeLuxe Container Corporation has been chartered with capital of 100 shares of preferred stock and 100 shares common stock, to manufacture and deal in a line of special paper boxes and containers. New company is represented by Gerber & Densen, 120 West Forty-second street, New York, attorneys.

New York, N. Y.—Pickwick Papers, Inc., has been organized with capital of 100 shares of stock, no par value, to deal in paper products of various kinds. New company is represented by Louis R. Teig, 51 Chambers street, New York, attorney.

Will Disorganize Paper Imports

The situation in Europe will entirely disorganize the present trend of paper imports into the United States, to judge from the import records from 1914 to 1918, according to a survey of the situation by Warren B. Bullock, manager of the Import Committee of the American Paper Industry. To what extent the trends of that period may be repeated in the present emergency cannot be foreseen. However, some salient features of foreign trade in the 1914-1918 period may well be reviewed at this time. Imports of dutiable paper for the year ending June 30, 1914, were valued at approximately $7,000,000; there are no statistics showing the tonnage imported of many standard grades. During the calendar year of 1918 the value of imports of dutiable paper totaled about $13,000,000, but of this amount nearly $9,000,000 was of cigarette paper. A rapid rise in the price per pound of imported paper is evident in all statistics which show tonnage of imports as well as values.

Wrapping paper imports in 1918 totaled approximately 4,000 tons, valued at $541,000, as compared with 1914 imports of 18,000 tons, valued at $1,028,000. Dutiable printing paper imports dropped rapidly in the first year of the war. On the other hand imports of all dutiable paper and paper boards, exclusive of cigarette, wrapping, coated and printing, increased in value in 1917 to the highest figure ever known up to that time.

In 1938, Germany, Austria and Czecho-Slovakia furnished about 14 per cent of the total value of imported dutiable papers. It would seem assured that a very large proportion of this business will be excluded by conditions, though in 1916 Germany was still shipping a considerable quantity of paper through the Allied blockade. Exports of most grades of paper from France and England showed practically no dropping off in quantity in 1916 as compared with 1914, and in some cases there were actually increased shipments.

Papers from abroad which continued to come to the United States during the 1914-1918 war period were as follows:

Austria-Hungary—Chiefly tissues.

Belgium—Parchment and fancy papers.

France—Drawing, carbon tissue, writing and cigarette papers.

Germany—Imitation parchment, greaseproof, drawing, tissue and tracing papers.

Italy—Tissue, hand-made and bible papers.

Norway and Sweden—Pulp, shoe and trunk boards.

United Kingdom—Writing, drawing, hand-made, bristol board, filtering, carbonizing, bible and high grade tissue papers.

Japan—High grade tissues, hand-made, vellum and text papers.

The Customs officials at Washington will not allow the present situation to interfere with the normal investigation and action on cases of suspected undervaluation, misclassification and dumping, and the cases now pending will be carried forward as usual. Over one thousand cases initiated by the Import Committee are now awaiting trial in the United States Customs Courts.

Meanwhile the administration authorities who have been pressing tariff rate reductions have announced that despite the situation there will be wholesale revision of existing reciprocal trade agreements, the writing of new agreements with countries with which no such agreements now exist, and the establishment of a general tariff policy to offset any eventualities.

Council of Paper Mill Unions Meet

OSWEGO, N. Y., September 25, 1939—The Northern New York Council of Paper Mill Unions held a meeting here last week which was largely attended. The organization has been in existence for about 25 years and is strongly organized. About 150 delegates attended the session, coming from Dexter, Watertown, Deferiet, Herring, Carthage, Harrisville, Gouverneur, Norfolk, Ogdensburg and Oswego. Considerable business was transacted at the meeting.

PAPER TRADE JOURNAL

Title Reg. U. S. Pat. Off.

Henry J. Berger
EDITOR

Ronald G. Macdonald
Editor Technical Section

Lynne M. Lamm
Washington Correspondent

Vol. 109 New York, September 28, 1939 No. 13

COMING EVENTS IN PAPER INDUSTRY

NEW ENGLAND SECTION. Technical Association of the Pulp and Paper Industry—Third Friday of each month at the Roger Smith Hotel, Holyoke, Mass.

DELAWARE VALLEY SECTION. Technical Association of the Pulp and Paper Industry—Second Friday of each month at the Engineers Club, Philadelphia, Pa.

LAKE STATES SECTION. Technical Association of the Pulp and Paper Industry—Second Tuesday of each month at the Conway Hotel, Appleton, Wis.

KALAMAZOO VALLEY SECTION. Technical Association of the Pulp and Paper Industry—First Thursday of each month at the Park, American Hotel, Kalamazoo, Mich.

NATIONAL SAFETY COUNCIL, PAPER AND PULP SECTION, Annual Meeting, Atlantic City, N. J. October 16-20.

BUSINESS GAINS AND PRICES

For the last four weeks the uptrend in general business activity has been accelerated by the unstable political and economic situation in Europe. From the low point of the current year in May, the index rose from 85 to 91 per cent, to decline in mid-June, since which time it has been mounting to touch 99.8 per cent on September 16, the highest since 1937. Business activity had been rising at a moderate rate before events abroad culminated in a critical economic situation in international trade, and since the normal trade relations between England, France, and Germany have been terminated, business in this country has been sharply upward.

An important result on American business due to hostilities abroad has been the stimulation of the durable or heavy goods industries, such as steel, which have been operating at a low rate of activity for several years. About two-thirds of the recovery in industry in the past month is attributed to events abroad, and one-third to the usual seasonal gains. This recovery is also indicated in the increase in industrial employment and payrolls. According to the Department of Labor figures, industry added 300,000 more workers from August 15 to September 15. Larger than seasonal increases are indicated in the increases in August of 3.1 per cent in employment and 6.5 per cent in payrolls, or $10,500,000 weekly. Employment was widespread, sixty-nine of the ninety manufacturing industries regularly surveyed reported increases. The revised index of factory employment, which was 96.4 per cent of the 1923-25 average for August, 1939, is the highest since December, 1937, and payrolls were higher than in any month since November, 1937. Compared with the indexes of August, 1938, increases of 8.6 per cent were shown in employment and 16.3 per cent in payrolls.

Conditions now prevailing in Europe if correctly interpreted by leading authorities, will result in trade gains and losses by importers and exporters. Poland and Germany imported 190 million dollars' worth of merchandise from this country in 1937 and sold us 138 million. These markets are conceded to be lost to us while current conditions prevail. Mining of the entrance to the Baltic Sea also disrupts communications with Finland and the little states of Estonia, Latvia and Lithuania. These four countries in 1937 bought 26 million dollars of American goods and we purchased 19 millions of their goods. In contrast, gains through a large increase in exports to England and France would in every probability greatly exceed the losses mentioned, but it entails further shifts in exports and imports.

The rapid expansion in industrial activity, due to conditions in Europe, has resulted in a rapid rise in the prices of raw materials. Cautious, hand-to-mouth buying has been quite generally practiced since the overbuying period in 1937. This policy was changed the first of this month and speculation in commodity prices created advances as much as 50 per cent in the first week, with partial recessions in most instances by the middle of the second week of the current month. Various explanations have been made of the extraordinary advances early this month and in major part it is attributed to the low level to which some commodities had declined. Speculation in securities, in which large investment funds were withdrawn from bonds to purchase stocks, was also a factor that encouraged the general flurry of speculative buying in many markets.

The rise in prices in most part seems justified by present costs, for the price level of many products, including paper, have been long out of line and too low to yield a fair profit to producers. This has been the case in many important agricultural products as well as in many grades of paper. After so long a period of deflation a moderate degree of inflation is conceded generally to be requisite to any substantial recovery movement, but the very rapid rise in prices has created new difficulties for business and the advice given by leaders in all industries against the dangers of a speculative boom, is good advice. In closing his address before the National Paper Trade Association convention in Chicago last week, D. C. Everest, president of the American Paper and Pulp Association said: "Those of us who went through the 1918 to 1920 period know what happens in the final wind up. It is mighty easy to go up in a balloon of speculation and rising prices, but it is mighty difficult to get down to earth again without getting injured. Having had one experience with outrageous speculation and remembering we have ample capacity for any rea-

sonable increase in consumption, let us not be run off our feet in the purchase of raw materials on the part of mills or finished paper on the part of merchants. It will not be a question of making more money in this industry but of hanging on to what you have now. When the parachute drops let us be prepared for it through sensible cooperation between mills and customers."

A similar note of caution was contained in the letter of Charles W. Boyce, executive secretary of the American Paper and Pulp Association, to paper and pulp manufacturers on September 21, in which he said in part: "The sharp reactions from speculative moves in the paper industry during which huge inventories of finished paper have piled up in the hands of consumers and raw materials at the mills, are fresh, in the memory of every paper manufacturer. Fluctuations from abnormally high to equally abnormally low production levels are generally considered injurious to the industry's welfare. The executive committee hopes that in recognizing the true facts and in basing policies upon sound business judgment, the industry as a whole can minimize unwarranted fluctuations through speculation both of price and volume of sales, and by so doing avoid the economic losses that result from such fluctuations."

Demand Expands for B. C. Paper

VANCOUVER, B. C., September 22, 1939—Pulp and paper mills in British Columbia are expected to gain considerable new business as the result of the situation in Europe. At present the B. C. plants are experiencing serious competition in the United States, South America and other markets. European markets will now have to seek more supplies from Scandinavian countries, and these in turn will thus have to curtail shipments overseas. A further factor is the necessity for the bulk of the Scandinavian pulp shipments in future being carried in Scandinavian ships. There is only a limited amount of such tonnage, and it will be subject to increased freight costs, all of which militate against major development of markets in the Americas and the Orient by the Baltic mills. British Columbia plants with land connections to the United States markets will be in favored position.

As far as the newsprint situation is concerned the elimination of competition in the Orient is expected to be beneficial to B. C. producers while the pulp makers will benefit not only in the United States but also in South America.

Stocks of the B. C. Pulp and Paper Company were at the lowest figure for months and comparatively inactive when war broke, and today, in common with those of eastern mills, they are in demand at rising prices.

The Powell River Company, operating the largest individual newsprint mill on the continent is another B. C. plant that is expected to benefit, as is that of Pacific Mills, Ltd. So far output has not been increased at any B. C. plant, but enjuiries are rolling in from many distant markets.

Production Ratio Report

These statistics are based upon paper production reports to the American Paper and Pulp Association:

COMPARATIVE MONTHLY SUMMARIES[1]

Months	1939	1938	1937	1936	1935	1934
January	77.5%	63.9%	90.3%	76.1%	65.8%	.....
February	81.7%	68.7%	90.1%	77.9%	70.0%	.....
March	84.0%	69.6%	90.3%	76.0%	70.5%	.....
April	82.9%	68.3%	92.1%	82.3%	70.0%	.....
May	80.2%	69.0%	90.6%	81.6%	69.4%	.....
June	79.5%	66.0%	87.3%	80.7%	72.3%	.....
July	75.1%	72.0%	81.8%	77.3%	64.9%	.....
August	83.0%	77.2%	82.9%	81.5%	70.9%	.....
September	.....	76.3%	78.6%	80.5%	71.9%	58.2%
October	.....	82.5%	73.5%	87.6%	75.6%	64.7%
November	.....	79.6%	61.9%	88.0%	75.3%	61.7%
December	.....	74.4%	54.5%	85.9%	71.2%	59.6%
Year Average	.....	72.3%	80.6%	81.3%	70.5%	.....
First 37 weeks	80.7%	69.6%	87.3%	79.1%	69.1%	.....

COMPARATIVE WEEKLY SUMMARIES[1]

CURRENT WEEKS, 1939		CORRESPONDING WEEKS, 1938	
August 12	82.9%	August 13	77.2%
August 19	82.9%	August 20	78.0%
August 26	83.4%	August 27	80.1%
September 2	85.2%	September 3	77.5%
September 9	74.0%	September 10	66.0%
September 16	92.2%	September 17	79.6%

The following statistics show the number of mills reporting by ratio groups:

	Number of Mills Reporting—Current Weeks					
Ratio Limits	Aug. 12, 1939	Aug. 19, 1939	Aug. 26, 1939	Sept. 2, 1939	Sept. 9, 1939	Sept. 16, 1939
0% to 50%	55	67	69	58	58	38
51% to 100%	251	236	232	241	229	177
Total Mills Reporting	306	303	301	299	287	215

PAPERBOARD OPERATING RATIOS

Per cents of operation based on "Inch-Hours" reported to the National Paperboard Association:

Year	Jan.	Feb.	Mar.	Apr.	May	June	July
1935	62%	68%	68%	63%	61%	66%	62%
1936	62%	67%	67%	70%	69%	70%	69%
1937	80%	86%	86%	88%	85%	77%	66%
1938	54%	60%	61%	57%	58%	56%	57%
1939	60%	67%	71%	69%	64%	67%	63%

Year	Aug.	Sept.	Oct.	Nov.	Dec.	Year Avg.
1935	67%	71%	77%	71%	61%	66%
1936	75%	78%	82%	80%	74%	72%
1937	74%	69%	65%	55%	45%	73%
1938	66%	66%	70%	65%	59%	61%

Week end. Aug. 12, 1939—71%
Week end. Aug. 19, 1939—72%
Week end. Aug. 26, 1939—72%
Week end. Sept. 2, 1939—73%
Week end. Sept. 9, 1939—63%
Week end. Sept. 16, 1939—79%

[1] Production-capacity ratios are based upon six-day capacity ratings which are adjusted periodically to correspond with the ratings reported by individual companies. Ratios are subject to revision until all reports are received.

Mills Show Conservative Tendency

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., September 25, 1939—In the prevailing uncertain conditions, there is apparently a conservative tendency on the part of manufacturers and to a certain extent, at least, on the part of merchants and consumers, against letting prices for paper get beyond control, according to statements in the trade here. In some quarters, it is intimated that manufacturers will be able to control the situation. Some manufacturers are restricting jobbers to their normal requirements in filling orders and others are making allotments in proportionate amounts. The point is brought out by some that prices were below normal before war conditions began in Europe. A number of mills are booked to capacity. In one case, and there are undoubtedly others, a mill could have sold up to February and March. Some mills are not naming any price on orders at the present time, but are booking orders with the understanding that the price will be that in effect at the time of shipment.

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CAREFUL control over production processes gives Cyanamid paper chemicals a uniform quality that promotes efficiency in your manufacturing methods. A wide variety is available for prompt delivery. It includes:

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SULPHONATED OILS

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TAPIOCA FLOUR

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Section of the
Technical Association of the Pulp and Paper Industry

Edited by Ronald G. Macdonald, Secretary

Review Of Paper Industry Literature

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Paper Specialties

Security Paper. Stanley B. Chamberlain. Brit. pat. 483,142 (April 12, 1938). Addition to Brit. pat. 440,421.—Paper of the kind described in the main patent is prepared by incorporating ribbon in the paper during manufacture. The ribbon may be of aluminum foil coated on each side with rayon, or the rayon ribbon may be printed on one or both sides with a suspension of noncorrosive metal, and may be colored.—A.P.-C.

Safety Paper. Viktor T. Bausch and Adolf Schroth, assignors to Felix Schoeller and Bausch. U. S. pat. 2,112,756 (March 29, 1938).—An inorganic salt that gives a color reaction with mild reducing agents, e.g., sulphites, is added to pulp or paper; substances that give color reactions with oxidizing agents may also be used. The substance may be sprayed, painted, printed, etc., on paper. In examples, mercurous tungstate is precipitated on, or manganese tellurite is added to, the beater furnish, or 10 per cent of manganese ferrocyanide is so precipitated and the paper impregnated with concentrated alkali selenite, or paper is printed with moist barium tellurite. (Cl. 91-67. 95)—A.P.-C.

Safety Paper and Method of Making the Same. Francis L. Simons and Mark W. Weiss, assignors to George La Monte & Son. U. S. pats. 2,129,362 to 2,129,364 (Sept. 6, 1938).—No. 2,129,362—The paper comprises several layers, and the surface and subsurface layers are of contrasting colors, the subsurface layer preferably being the darker. Suitable indicia are printed on the surface layer with material such as linseed oil or a clear litho-varnish. On wetting the paper, the surface layer becomes more transparent, revealing the darker subsurface layer except at the points covered with oil or varnish. No. 2,129,363—The surface of the sheet is of a color other than white and indicia are applied thereto using material of a higher shade (preferably substantially white). The indicia are of such a character as to appear prominently when the sheet is dry and to become substantially less discernible on wetting the paper. No. 2,129,364—The sheet contains a substantial amount of filler such as clay or calcium carbonate. Indicia are printed on it with material such as linseed oil or a clear litho-varnish. On wetting with water, the paper as a whole becomes more transparent except those portions which are covered with the oil or varnish. (Cl. 283-8)—A.P.-C.

Treatment of Cellulosic Materials. Christopher Luckhaupt. Fr. pat. 821,060 (Nov. 26, 1937); Brit. pat. 482,847 (April 6, 1938).—Natural or artificial cellulose materials which are insoluble in fused terpenol hydrate are impregnated with fused terpenol whereby the materials are hardened and their mechanical properties and their resistance to water, fire and bacteria are improved. The materials are preferably heated after they have been impregnated.—A.P.-C.

Laminated Paper. Van Hamm Wilshire, assignor to The Specialty Paper Company. U. S. pat. 2,123,760 (July 12, 1938).—A highly calendered greaseproof or glassine sheet is combined with a thicker sheet of wax absorbent paper held together by an intermediate layer of wax and having surface coatings of wax on both sides. Such a composite sheet is particularly suitable for the production of food containers. (Cl. 154-50)—A.P.-C.

Light Sensitive Paper and Method of Treating Same. Clyde A. Crowley and Geo. H. Goodyear, assignors to the Huey Company. U. S. pat. 2,113,423 (April 5, 1938).—A coating for blue print paper which does not bleed during development comprises a light-reducible ferric complex, such as ferric ammonium oxalate, a ferricyanide salt such as that of potassium, and ammonium nitrate. (Cl. 95-6)—A.P.-C.

Greaseproof Impregnated Fibrous Article. Fred H. Lane, assignor to Hercules Powder Company. U. S. pat. 2,114,393 (April 19, 1938).—Porous fibrous material is impregnated with a resin comprising esterified pine-wood resin produced by extracting resinous wood with a coal-tar hydrocarbon material, removing the hydrocarbon by evaporation, extracting the residue with a petroleum hydrocarbon, and recovering a gasoline insoluble resin. (Cl. 91-68)—A.P.-C.

Corrugated Structure. Allen L. Spafford, assignor to Wood Conversion Company, U. S. pat. 2,104,060 (Jan. 4, 1938).—A corrugated structure is made of one, two or three elastic sheets, such as creped paper having parallel creping, which is arranged either parallel, transverse or otherwise, to the corrugations. If preferred the individual sheets may be diagonally or doubly creped, or may be waterproofed, such as asphalted, or creped asphalted paper. (Cl. 154-55)—A.P.-C.

Relation of Lignin Content to the Strength Of Paper and Boards*

I. Literature Survey and Progress Report

By Edwin C. Jahn[1] and C. V. Holmberg[2]

Abstract

The work on the examination of the chemical and physical characteristics of pulps is outlined, including the study of the physical properties of some of the papermaking fibers, and the effects of treating the fibers by several of the commercial methods in the laboratory.

A survey of the literature, with particular emphasis on the effect of the lignin content on the physical properties and the changes in the chemical composition of the fibers indicates that much work remains to be accomplished in this field.

The relation between the chemical composition of the fibers of a paper sheet and its physical characteristics is still largely a matter of conjecture. However, we do know a great deal about the effect of various chemical treatments, especially the conditions of cooking and bleaching, upon the papermaking properties of the treated fibers. For example, overcooking or overbleaching or any drastic chemical treatment resulting in degradative oxidation or hydrolysis of the cellulose in the fiber, as indicated by viscosity, copper number, or some other index, results in weaker pulp sheets and paper. Raw or undercooked pulp has a high lignin content, stiff fibers, and forms a harsh brittle sheet. The effect of the lignin content *per se* on the physical properties of the fibers is unknown, however, since longer or more drastic cooking brings about changes in the carbohydrate constituents, and may cause colloidal and physical changes, as well as reduce the lignin content.

One reason why a definite relationship between the chemical constituents of the fiber and its papermaking qualities has not been evaluated is the difficulty of so doing. In the first place, the constituents, such as lignin, polyuronides, pentosans, lack exact definition. Secondly, it is difficult to isolate one constituent or group of chemically related substances without removing or altering some of the others. Also, physical factors, such as fiber dimensions and freeness, may vary as certain constituents are removed, confounding the results. Furthermore, the chemical constituents are not uniformly distributed throughout the walls of a fiber, but vary in amounts in its different anatomical parts.

In spite of these difficulties, deserved attention is being given to the broad problem of chemical composition in relation to papermaking properties. Many pulp studies include a careful chemical analysis for correlation with physical and optical data. Also, special types of fibers, such as holocellulose, raw pulps, and pulps ground at high pressures and temperatures, and then chlorinated, all having radically different chemical composition from the usual commercial fibers, are being studied.

The Composition of the Cell Wall in Relation to Its Structure

The chemical composition of the cell walls of xylem tissue in relation to the microstructure of the wall is still a controversial subject. There is general agreement among investigators, however, with regard to the larger visible structure of the wood fiber wall and, to a lesser extent, regarding the chemical composition of its major parts. Only the more generally agreed upon concepts will be presented here. More detailed information can be found in the important recent contributions to our knowledge of cell walls by Ritter *(46-52)*, Harlow *(21-26)*, Lüdtke *(38-40)*, I. W. Bailey *(7, 8, 34)*, A. J. Bailey *(2-5)*, Dadswell *(14)*, Scarth *(53-54)*, Farr *(15-16)*, Frey-Wyssling *(19)*, Freudenberg *(17)*, and their associates, and to the literature survey by Heuser *(28)*.

A typical wood fiber consists of a primary (cambial) and a secondary wall. I. W. Bailey shows evidence for the existence of a very thin truly inter-

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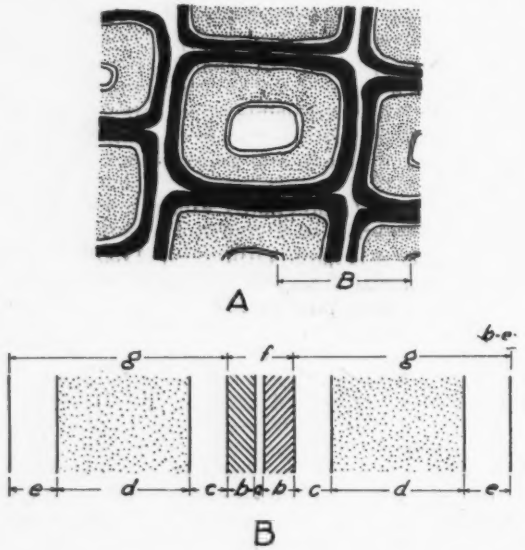

FIG. 1.

Cell Wall Parts According to I. W. Bailey. A—Cross section of a fiber. B—Section of two adjacent cell walls. a—Intercellular substance. b—Primary (cambial) wall. c—Outer layer secondary wall. d—Central layer secondary wall. e—Inner layer secondary wall. f—Compound middle lamella. g—Complete secondary wall. b-e—Complete cell wall of one fiber.

cellular substance between the primary walls of adjacent cells, which is a true middle lamella, Fig. 1. The true middle lamella plus the two adjacent primary walls comprise the compound middle lamella seen in stained cross sections of wood. The bulk of the cell wall thickness is in the secondary wall, and it is this wall which makes up the greater part of a chemical pulp fiber.

Chemically, a lignified cell wall, such as a wood fiber, is made up chiefly of cellulose, hemicelluloses (polysaccharides and polyuronides) and lignin. The total wall may be considered essentially two interpenetrating systems, i.e., a matrix of crystalline cellulose among the interstices of which are deposited amorphous lignin and noncellulosic constituents. The compound middle lamella is heavily lignified, and this region and the outer parts of the secondary wall appear to contain most of the lignin, whereas the secondary wall is high in cellulose content but contains some lignin throughout. By the proper microtechnique, either system (lignin or cellulose) may be completely dissolved without seriously disturbing the pattern of the remaining system. Not so much is known about the distribution of the hemicelluloses, but they are apparently present throughout the wall. Certain evidence indicates that at least a portion of the polyuronides is associated or combined with the lignin *(43)*.

Optical studies reveal that the true intercellular substance is completely isotropic and the heavily lignified primary walls also, commonly, appear to be isotropic. However, by use of refined techniques *(7)*, it is possible to show that the primary walls contain an anisotropic substance; probably the original crystalline cellulosic cambial wall, buried in a heavy deposition of amorphous material. The secondary wall is strongly anisotropic, although in heavily lignified cells the outermost part frequently blends optically with the primary wall so that the apparent thickness of the compound middle lamella is often exaggerated. The secondary wall exhibits different optical properties in its different directions *(7)*. There is a thin outer and inner portion of the secondary wall which is anisotropic in cross section and isotropic in longitudinal section, whereas the broad central part of the secondary wall is isotropic or less conspicuously birefringent in cross section but strongly birefringent in longitudinal section. These differences are probably due to differences in orientation of cellulose micelles or molecular chains, the central portion having an orientation nearly parallel to the fiber axis. In the case of basswood ray cells the principal crystal arrangement is perpendicular to the fiber axis as contrasted with the parallel arrangement in the fibers *(52)*.

Effect of Pulping on Structure and Chemical Composition of the Cell Wall

Chemical pulping is considered essentially a delignification process, although not all the lignin is removed and most of the less resistant carbohydrates are. The effect of digestion upon wood structure has been recently studied by several investigators. Abrams *(1)* found that dilute sodium hydroxide and sodium bisulphite solutions acted strongly upon the middle lamella (compound middle lamella, the heavily lignified region between secondary walls).

A. J. Bailey *(2)*, by micro-methods, found that the compound middle lamella of Douglas fir contained 71 per cent lignin *(4)* and 14 per cent pentosans *(5)* with 4 per cent cellulose. Upon autoclaving thin sections of four species of woods at 95 deg. C., Bailey *(2)* found that commercial cooking liquors attacked the compound middle lamella region causing large portions of it to disappear, the sulphate process causing nearly complete removal. However, in no case was all of the middle lamella region removed. The resistant segments of the middle lamella areas were completely removed by sodium hypochlorite.

A. J. Bailey points out that there is a similarity between the above residual segmented lamella and the spirally wound lignin sheath which Carpenter and Lewis *(13)* found on raw cooked fibers. This sheath is heavily lignified, is insoluble in 72 per cent sulphuric acid, and resists swelling. In well-cooked fibers the greater part of the lignified sheath is removed and exposes an elastic membrane which is responsible for the bead-like swelling of normal pulp fibers. Overcooking modified this membrane so that it loses its elasticity, and fibrillation of the fiber results rather than ballooning when treated with swelling agents. Normal bleaching was found to remove the last traces of the lignin sheath, whereas overbleaching has an effect on the fiber similar to overcooking.

Bixler *(9)* digested thin cross sections (20 microns) of spruce under conditions approximating commercial methods. He found that soda and sulphate liquors remove the intercellular substance, between the primary walls, very rapidly but do not attack the cell wall lignin to any great extent until the former is nearly completely removed. Sulphite liquor does not have this selective action, but removes both intercellular and cell wall lignin at about the same rate, though more slowly than the rate at which alkaline liquors dissolve lignin.

The action of sulphite liquor would appear to differ from that of chlorine and of ethanolamine, as observed by Harlow *(22, 60)*. He showed that both of these delignifying agents removed secondary wall lignin, so that the secondary walls almost completely disintegrated in 72 per cent sulphuric acid, before appreciably attacking the lignin of the compound middle lamella region. However, Bixler observes that, although 1 hour sulphite digestions do not remove all the lignin from the secondary walls, the staining reaction is concentrated in the outer portion of the walls. The inner portion of the secondary walls is completely soluble in cellulose solvents whereas the outer portion is not. The outer portions of the secondary walls of raw 15 to 30 minute soda digested sections react to lignin stains, and dissolve in lignin solvents, but after 1 hour of digestion the secondary wall showed no positive evidence for the presence of lignin.

Bixler found that the primary (cambial) wall is inelastic and causes the constrictions occurring on balloon swelling. He also confirms the work of I. W. Bailey on the birefringency of the primary or cambial walls. After 30 minutes of sulphite digestion these walls behave as cellulose. The work of these various cell wall investigators harmonize in most particulars (differences in many cases are due to definition), and go a long way toward explaining cell wall structure and the effect of digestion on the cell wall.

Considerable information has been gathered with respect to the constituents removed in connection with numerous investigations on the effect of the different reaction variables of the three important pulping processes. A recent paper, by Brauns and Grimes *(11)* on the removal of the chemical constituents of wood in the soda cooking process, gives figures confirming the view that in the early stages of the cook, carbohydrates are more rapidly removed than lignin, after which follows a simultaneous dissolution of carbohydrates and lignin, while in the later stages of the cook there is little further removal of hemicelluloses, but more lignin is dissolved. Not all of the lignin is dissolved, however, the pulp retaining 5 to 6 per cent. This residual lignin is easily removed by an acid bleach but not by an alkaline bleach. This is considered to support the idea that part of the lignin is combined with carbohydrates in an ether-like linkage *(10, 18)*. That lignin is chemically combined with hemicellulose *in situ* is also supported by the methylation and chlorination studies of Harris, Sherrard, and Mitchell *(27)*, and by studies of Norman *(43-45)*, who found, in carrying out extractions of wood and straw with sodium sulphite that chlorination is as necessary for the removal of the polyuronide hemicelluloses as for the lignin.

Relation of Chemical Composition to Papermaking Qualities

The literature on the relation of the various chemical constituents to physical properties of pulp sheets is meager. Frequently a chemical analysis (alpha cellulose, furfural, ash, extractives, copper number, residual lignin) is made of a pulp for correlation with its physical properties. Chemical and physical data serve to characterize a pulp better than physical tests alone. However, the effect of the individual chemical components of the fiber on its properties is largely a matter of opinion. It is best not to confine the discussion to lignin only, because in most instances, other components as well as physical variables are also involved.

The chemical constituents which occur in pulp fibers and which can be isolated or analyzed with some degree of accuracy include cellulose, lignin, extractives, ash, pentosans, and polyuronides. The latter two, together with any noncellulosic hexosans or degraded cellulose, comprise the hemicellulose group, which may be roughly estimated by measuring alkali solubility. There is also apparently a lignin-hemicellulose (polyuronide) fraction. The total carbohydrate portion, i.e., cellulose plus hemicellulose (cellulosans and polyuronides) may be isolated as a group and is termed holocellulose or skeletalsubstance.

Pulp, of course, frequently contains decomposition products of its original components, such as oxycellulose, caused by overbleaching cellulose, or shortened cellulose molecules, i.e., hydrocellulose, caused by hydrolytic action during digestion or by any drastic treatment. These decomposition products usually have a very marked effect on the strength of the fiber and they have been indexed and characterized by viscosity, copper number, alkali solubility, and methylene blue absorption tests.

Effect of Constituents Other Than Lignin

Mechanical pulp presumably contains all the constituents of the original wood, but has lost some of the soluble extraneous components. Schwalbe *(56)* observes that spruce mechanical pulp is more sensitive to light, heat, and ozonization, and has lower hygroscopicity than the original wood. He believes these changes are due to removal of soluble carbohydrates during the grinding, since newsprint treated with glucose solutions retains its color better than untreated paper.

A change directly related to the fine structure of the cell wall was observed by Green and Yorston *(20)*. They found that subjection of wood blocks to mechanical stress made it liable to fiber degradation during acid cooking, resulting in weaker sheets. Screen classification of sulphate cooked crushed and normal woods showed no difference in fiber length, the weakness being due to susceptibility to acid degradation in the wood subjected to compressive stresses. No explanation for this effect is suggested. The authors attribute the low quality of sulphite pulp from groundwood tailings to the stresses they have undergone.

The development of techniques *(55, 58)* for the isolation of almost all the total carbohydrate fraction of wood opens a way to study the effect of the presence of the less resistant hemicellulose in the fiber on its papermaking properties. Van Beckum and Ritter *(9)*, have compared the composition of holocellulose, hydrolyzed holocellulose, and Cross and Bevan cellulose. As would be expected, holocelluose contains nearly all the pentosans, polyuronides and acetyl groups of the original wood, but none of the lignin. Expressed on the basis of the per cent of the original wood, holocellulose contains 2.4 to 6.3 per cent more alpha cellulose than does Cross and Bevan cellulose, and 8.5 to 13.4 per cent more than commercial pulps from the same species. There is much less degradation of the original cellulose by the Van Beckum and Ritter holocellulose method than the Cross and Bevan chlorination procedure or by commercial pulping methods.

Work by Staudinger and Jurisch *(57)*, shows that Schmidt's chlorine dioxide method for isolating the total carbohydrate fraction of wood causes almost no degradation, as observed by changes in the degree of polymerization, measured by viscosity, of purified cotton treated by aqueous chlorine dioxide solution. For example, a 24-hour treatment in a 0.25 per cent solution of ClO_2 caused a drop in the degree of polymerization from an initial of 1440 to 1050; whereas chlorine water (7.5 g. per 1.) caused a change in the degree of polymerization after 25 hours from an initial of 1200 to 68, and calcium hypochlorite (2.6 g. active Cl per 1.) after 25 hours caused a drop from an initial of 2300 to 89.

Very recent work has been reported in this country and in Europe on some of the physical papermaking properties of holocellulose. Jayme, Storch, Kerler, and Schwab *(32)*, carried out orientation studies on the properties of holocellulose prepared by a modification of the Van Beckum and Ritter method. Instead of alcoholic ethanolamine they treated the chlorinated material with ammonium hydroxide, calcium hydroxide or very dilute sodium hydroxide in an attempt to lay the basis for a commercial method. The products contained more lignin (1.21 to 6.14 per cent in beech and 0.3 to 5.6 per cent in spruce) than obtained by Van Beckum and Ritter. In the case of the low lignin containing fiber there

is a definite loss in pentosans and alpha cellulose on the basis of the original wood. After beating in a Jokro mill, these holocelluloses gave pulp sheets of good mechanical properties.

Houtz and Kurth *(29)*, found that Van Beckum and Ritter holocellulose and fibers, high in noncellulosic carbohydrates, drop rapidly in freeness with beating, all in cases reaching a glassine stage in less than 30 minutes. Products containing somewhat less pentosans and polyuronides but more beta cellulose (degradation of cellulose by overchlorination) beat even more readily, indicating the marked effect of cellulose degradation products on hydration. Extraction of holocellulose with a 0.5 per cent solution of ammonium oxalate, decreases both pentosan and polyuronide content, and results in a somewhat slower rate of hydration. The authors believe that these facts substantiate the chemical theory of beating and the formation of a gelatinous hydrate from the hemicellulosic or degraded cellulosic materials. The holocellulose fibers formed sheets of very good strength, developing high bursting and folding strength with short beating time. The initial strength is high indicating a long fibered pulp with high individual fiber strength. Pulps high in hemicellulose, however, age much more rapidly than high alpha pulps.

Although it is generally agreed that pulps low in pentosans develop strength in the beater with difficulty, Klingstedt *(35)*, claims that pentosan content, as determined by the barbituric acid method, has no marked effect on maximum strength or beating time. However, he found that the rate of hydration and strength of sulphite pulp increases with increase in amount of alkali soluble material. These two facts are difficult to correlate unless the higher alkali solubility be due to nonpentosan hemicellulose or to cellulose degradation products.

There is no direct evidence for the presence of pectins in wood or pulp, although a number of workers have claimed their presence on the basis of indecisive tests. That uronic acids are present is without doubt, and it would seem advisable to calculate all CO_2 yielding substances simply as uronic acid anhydride. Wurz and Swoboda *(61)*, however, calculated CO_2 obtained by distillation of pulp in 12 per cent HCl as galacturonic acid, a pectin uronic acid, and found that easily parchmentizable bleached sulphite pulps contained 2.06 to 2.50 per cent, difficultly parchmentizable pulps, 1.43 to 1.60 per cent, and very difficultly parchmentizable, 0.77 to 0.94 per cent.

All the uronic acids present can apparently be isolated in holocellulose, but the majority are removed by mild hydrolysis, dilute acids or alkalis. However, pulps contain some uronic acids, but it is possible that they may be due in part or entirely to mild oxidative degradation of the cellulose, giving rise to carboxyl groups. The reaction of pectic solvents have been shown to have little or no effect on the cuprammonium viscosity of pulps *(37)*.

The influence of minor fiber constituents on pulp properties is being studied by Brauns and Lewis *(12, 37)* who have investigated the nature of the cuprammonium hydroxide insoluble fraction of pulps. Visual and other evidence indicates that the skin-like material, which is the limiting membrane of the balloon-like swellings resulting from the action of swelling agents on certain types of fibers, is insoluble in cuprammonium hydroxide. A cuprammonium insoluble fraction was obtained as a copper compound from bleached sulphite pulp in yields averaging 1.36 per cent. One-third of this residue is copper, and 97 per cent of the remainder can be determined, after hydrolysis, as a reducing sugar. Purification of this pulp with hot 1 per cent alkali reduces the per cent of this residue to 0.1. A very pure wood cellulose containing 0.70 per cent pentosan, 99.1 per cent alpha cellulose and a copper number of 0.049 appears to have no membrane or cementing substance over the secondary wall and did not balloon on swelling. The amount of cuprammonium insoluble residue was negligible. This pulp would not form a sheet of any strength.

In the case of unbleached sulphite pulps, the cuprammonium insoluble residues are more than half lignosulphonic acids together with a smaller amount of carbohydrate.

Effect of Lignin

There is comparatively little data in the literature on the effect of lignin in pulp on its papermaking properties. Most of the results that are given cannot be definitely attributed to lignin alone, since the effects of numerous other variables are not accounted for. Lewis, Brauns and Buchanan *(37)*, reported the physical characteristics of kraft pulps containing lignin varying in amounts from 22.2 to 8.6 per cent. Increased delignification results in pulp with less freeness and stiffness, and greater strength properties. It was observed that no ballooning resulted on treatment of the fibers with swelling agents until the lignin content had been reduced to 15.9 per cent. Most of the residual lignin is in the outer walls of the fiber, presumably in primary and outer secondary walls, until the content is reduced to 8.6 per cent.

Jayme and Wettstein *(33)*, in a study of the chlorination of Asplund pulp (mechanical pulp prepared at 10 atmospheres pressure and 180 deg. C. under which conditions the lignin is believed to become thermoplastic), prepared a series of fractions with different lignin contents. Pulps with a lignin content of 12 to 19 per cent form sheets with difficulty. When the lignin content has dropped to 4 to 6 per cent, sharp maximum values in strength occur. The higher the lignin content the greater the time of beating required to reach 65 deg. Schopper-Riegler freeness.

The role of lignin in relation to the strength and properties of a paper sheet may differ from that of a pressed fiber board. However, calendering a paper sheet containing lignin may bring about changes comparable to those produced in a hot pressed fiber board. It is known that isolated or partially isolated lignin will fuse, forming true resin, when subjected to heat and pressure *(31, 36, 41)*. Whether any analogous change occurs in the lignin of paper or boards subjected to heat and pressure is a moot question. Bailey *(6)*, presents evidence to show that the adhesive force in hard pressed fiber boards is due to the cellulose and not to the lignin. Thin sections of a fiber board, prepared by cooking chips in 4 per cent sodium sulphite at 70 pounds steam pressure and then grinding, were treated with cellulose solvents and lignin solvents. It was observed that removal of the cellulose destroyed the structure whereas removal of the lignin caused little change.

However, on the basis of Carpenter and Lewis' work *(13)*, the fiber Bailey worked with would be expected to be largely surrounded by a lignin sheath, except where the sheath was broken by the mechanical attrition to which the cooked chips were subjected.

Bleached pulps when wet formed and pressed without heat will form strong boards. When dry bleached cellulose is hot pressed it will not form a board with any strength, whereas mechanical pulp or sawdust will *(30, 42)*. For example, a water and alcohol-benzene extracted western white pine 100 mesh sawdust, when pressed at 205 deg. C. and 7000 pounds per square inch, formed a strong dense board having a modulus of rupture of 862 kilograms per square centimeter, whereas bleached sulphate pulp, dry ground to pass 100 mesh and pressed under comparable conditions formed a weak board having a modulus of rupture of only 140 kilograms per square centimeter.

Insofar as chemical composition affects the strength of paper and boards made from lignified fibers, it is likely that the physical properties are not controlled by one chemical constituent. The influence of lignin-polysaccharide complexes, pentosans, polyuronides, cellulose and lignin in relation to each other, and in relation to the position of their occurence in the fiber should not be lost sight of.

Progress Report on Experimental Work

Because of the practical desirability of relating this work to commercial pulps and processes, it is essential to study a series of partially delignified pulps following commercial methods, and also to study commercial pulps low in lignin content. Theoretical considerations demand that conditions of delignification be followed which affect the other constituents as little as possible. The following series of pulps are being studied:

Sulphate pulps: series of cooks, in which the time is varied, on eastern white pine mechanical pulp to give pulps of different lignin content, from 23.7 to 3 per cent.

Sulphite pulps: series of cooks, in which time is varied, on eastern white pine chips to give pulps of different lignin content, from very raw to well cooked pulps.

Chlorinated pulps: series of eastern white pine mechanical pulps given different number of chlorination treatments.

Commercial unbleached and partially delignified pulps: lignin content reduced to zero in stages by mild delignification.

Delignification of eastern white pine mechanical pulp by Schmidt's chlorine dioxide procedure, giving a series of "holocelluloses" of differing lignin content.

A chemical analysis is made on each of the above series. Each pulp is then fractionated by a screen classifier into its various sizes and then definite proportions of the fractions recombined to make a pulp which is standard with regard to fiber length. Wherever possible the pulps are standardized to the same freeness. The strength characteristics of sheets made from the various pulps are determined.

A number of orienting experiments were carried out to determine a method of delignification which had the least effect on the other chemical constituents of the fiber. These experiments and the results are as follows:

Use of Chlorine Water

An equivalent of fifty grams of oven dry extractive-free eastern white pine mechanical pulp was suspended in 2 liters of water, and sufficient chlorine water of known strength added to furnish 0.2 grams chlorine per gram of pulp and to make the consistency 1.25 per cent of oven-dry material. After agitating for 5 minutes, 500 cubic centimeters of 3 per cent sulphurous acid were added, and the suspension was stirred for 2 minutes. The pulp was filtered rapidly and washed with two 200 cubic centimeter portions of 3 per cent monoethanolamine in 95 per cent ethyl alcohol. After washing, the pulp was digested for two 10-minute periods in two 1-liter portions of 3 per cent alcoholic ethanolamine. After digestion, the pulp was washed with four 200 cubic centimeter portions of ethanolamine reagent, two 200 cubic centimeter portions of alcohol, and finally with water. The excess liquid was removed by means of a suction filter, and the yield calculated. The sample used for the moisture content determination (yield) was used for the analysis of lignin and pentosans. The remainder, after analysis, was again treated as described above, using proportionately smaller amounts of reagents, and the process was continued for 4 treatments (Table I).

Use of Chlorine Dioxide

To study the effect of chlorine dioxide upon groundwood pulp the method described by Schmidt, Tang, and Jandebeur *(55)* was used. Chlorine dioxide was generated by heating a mixture of potassium chlorate, oxalic acid, and sulphuric acid. The gas was washed with a small amount of water and passed into a large container of water externally cooled to 4 deg. C. by an ice-salt mixture. When the desired amount of chlorine dioxide was absorbed, sufficient liquor to furnish 0.70, 0.30, and 0.55 grams ClO_2 per gram of pulp for 5 gram samples was transferred to brown bottles for runs 1, 2, and 3, respectively. The pulp was added to the liquor and agitated at intervals of 10 minutes and the bottles stoppered tightly. After one hour of treatment a measured excess of 30 per cent aqueous pyridine was added to each sample, and the bottles restoppered. In run 1 the samples were stored at 4 deg. C. and removed after 1, 4, 8, 12, 16, 24, 36, and 52 hours, while run

TABLE I

DELIGNIFICATION OF MECHANICAL PULP WITH CHLORINE WATER AND 3 PER CENT ALCOHOLIC ETHANOLAMINE

Number of chlorinations	Yield, dry extractive free pulp per cent	Lignin		Pentosans	
		Chlorinated pulp per cent	Extractive-free original pulp per cent	Chlorinated pulp per cent	Extractive-free original pulp per cent
0	....	....	27.40	....	12.12
1	94.58	21.56	20.39	10.12	9.57
2	91.58	10.35	9.48	10.22	9.36
3	83.17	2.05	1.70	10.40	8.65
4	78.28	1.65	1.29	11.14	8.72

TABLE II

DELIGNIFICATION OF MECHANICAL PULP WITH CHLORINE DIOXIDE AT 4 DEG. C.

Time of Treatment hr.	Grams ClO_2 available per g. pulp	Grams ClO_2 consumed per g. pulp	Yield, per cent	Lignin, per cent of treated pulp	Lignin, per cent of extractive-free original pulp	Pentosans, per cent of extractive-free original pulp
			Run 1			
0	...	...	...	27.78	27.78	12.12
1	.708	...	98.76	24.57	24.3	
4	.708	.248	98.48	22.92	22.8	
8	.708	.315	98.62	21.26	21.0	
12	.708	.325	97.36	20.62	20.0	
16	.708	.373	98.60	19.69	19.4	
24	.708	.441	95.08	18.69	17.8	
36	.708	.389	95.72	17.64	16.8	
52	.708	.365	95.40	17.30	16.5	
			Run 2			
days						
3	.269	.200	94.68	19.15	18.2	
6	.269	.227	93.96	16.75	15.8	
8	.269	.239	90.18	15.12	14.1	9.93
10	.269	.245	88.50	14.87	13.2	10.66

TABLE III

DELIGNIFICATION OF MECHANICAL PULP WITH CHLORINE DIOXIDE AT ROOM TEMPERATURE (25 DEG. C.)

Run 3

Time of treatment, days	Grams ClO_2 available per g. pulp	Grams ClO_2 consumed per g. pulp	Yield, per cent	Lignin, per cent of treated pulp	Lignin, per cent of extractive free original pulp	Pentosans, per cent of treated pulp	Pentosans per cent of extractive-free original pulp
0	....	....	....	27.78	....	12.12	....
0.5	0.604	.240	94.18	17.50	16.48	8.63	8.13
2	.549	.508	83.50	7.86	6.56	11.72	8.79
4	.549	.536	79.28	5.24	4.15	12.11	9.59
6	.549	.543	78.30	4.43	3.48	8.38*	6.48*
8	.673	.656	71.18	1.05	0.75	9.12	6.49

* One determination for this figure.

2 was kept at the same temperature for 3, 6, 8, and 10 days. Run 3 was kept at room temperature (25 deg. C.) and removed after 2, 4, 6, and 8 days. At the end of the desired time interval the samples were filtered and washed with water until free of pyridine, the mat broken, dried, weighed, and the yield calculated. Portions of the spent liquor were titrated with 0.1 N sodium thiosulphate. The dry samples were analyzed for lignin and pentosans (Tables II and III).

The determination of lignin was carried out by treating the oven dry material with 70 per cent sulphuric acid for 16 hours at 10 deg. C. Pentosans were determined by distillation of samples with 12 per cent hydrochloric acid and precipitation of the furfural with phloroglucinol.

Discussion of Orienting Experiments

At room temperature aqueous chlorine dioxide treatment is an easy and convenient method for delignifying comparatively large quantities of mechanical pulp. The delignified pulp is much whiter (snow white) and freer than are corresponding pulps delignified with chlorine water. On the basis of Staudinger and Jurisch's experiments *(57)* the chlorine dioxide treatment should cause almost no degradation of the cellulose, whereas the chlorine water treatment would be expected to cause a marked change in the degree of polymerization.

Several experiments were carried out using chlorine gas instead of chlorine water, but the large masses of pulp were unevenly chlorinated. Both chlorine water and chlorine dioxide gave uniform treatments.

Losses in pentosans on treatment with chlorine water would be expected, due to unavoidable hydrolysis. The losses of pentosans in the chlorine dioxide treated pulps are not so easily explained. Apparently it is difficult to avoid pentosan losses in preparing holocelluloses from conifers, for Van Beckum and Ritter *(59)* and Houtz and Kurth *(29)* also show substantial losses in preparing coniferous holocelluloses by the use of gaseous chlorine and 3 per cent alcoholic ethanolamine. Van Beckum and Ritter suggest that there is a difference between the furfural-forming materials in the original wood and the holocellulose.

It seems likely on the basis of Tables II and III that the losses in pentosans may be greatly reduced by carrying out the reaction at temperatures somewhat less than room temperature and by using more dilute solutions of chlorine dioxide and adding fresh amounts at intervals as it is consumed. This is being investigated.

The series of delignified sulphate pulps has been prepared and analyzed, and also the series of chlorinated pulps has been completed. Work on the other series and on the examination of the chemical and physical characteristics of the pulps as outlined above is being continued and will be reported upon when completed.

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Growth Factors Influencing the Value of Jack Pine for Kraft and Sulphite Pulps*

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Abstract

In order to promote the most effective use of jack pine growing over large areas in the Lake States, particularly in supplementing diminishing supplies of other pulpwood species, the U. S. Forest Service has conducted selective pulpwood cutting experiments. Pulping technique has been studied and yield and quality data have been obtained at the Forest Products Laboratory on selected samples from the cuttings.

The results of the experiments give promise of a wider utilization of this species for both kraft and sulphite pulps and enable the accurate determination of ultimate conversion values for different cutting methods.

The yield of kraft pulp per cubic foot of solid wood or per cord was considerably higher for the slower-growth, suppressed trees and for the lower portions of all the trees than for the less dense wood occurring in the more rapid-growth types and in the upper portions of the trees.

The strength properties of the kraft pulps showed rather wide variations both as to position of bolt in the tree and as to diameter class. All of the strength properties increased appreciably in progressing upward in the present merchantable trunk.

The sulphite pulping experiments show possibilities of a much more complete reduction of jack pine to pulp than has ordinarily been realized in practice. To obtain this degree of reduction it was necessary to cook to a low bleach requirement employing strongly acid liquor, longer cooking schedules, and lower temperatures than are ordinarily used. Partly because of this the strengths of the jack pine pulps were, in general, lower than those of spruce sulphite pulp.

The yield of screened sulphite pulp per cubic foot of solid wood decreased as the diameter increased; the yield from the largest trees was approximately 10 per cent lower than from the smallest. On a cord basis the yields from the intermediate sizes were appreciably higher than from either the very rapid or very slow growth types.

On the whole, greater differences were exhibited by the sulphite pulp as well as the kraft obtained from different portions of the trees than by those obtained from the different diameter classes. The yield on a weight basis decreased from the tops to the butts,

FIG. 2.
Forty-eight year old jack pine stand, Itasca County, Minnesota, after cutting 61 per cent of the commercial volume.

FIG. 1.
Forty-eight year old jack pine stand, Itasca County, Minnesota, before pulpwood cutting.

FIG. 3.
Forty-eight year old jack pine stand, Itasca County, Minnesota, after clear cutting.

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but on a volume basis the yield increased from the tops to the butts. The strength of the pulps from the butt bolts was appreciably lower than from the middles or tops.

In general, the trends in yield and pulp quality for the different classes of material examined were quite similar for both the sulphate and sulphite processes.

Segregation of the wood should be advantageous for the production of both kraft and sulphite pulp to attain the maximum yield and quality with regard to specific properties of products for which jack pine has heretofore not been considered suitable.

Many areas in the Lake states support large tracts of young jack pine. Some of these areas are now capable of producing a considerable quantity of pulpwood and others are approaching a point where they will soon be available in commercial size. Some of the characteristics of jack pine that make it a particularly desirable pulpwood species from a silvicultural point of view are its relatively rapid rate of growth during the first 30 or 40 years and its greater adaptability to propagation in some districts than other conifers. It is highly desirable to find methods for a more extensive use of jack pine, both to supplement the diminishing supply of other pulpwood species and to maintain stabilized employment at established pulp mills and in the surrounding territories.

Jack pine is now used extensively in the production of bleached and unbleached kraft pulp in the Lake states. The maintenance of the present production and any further development in this region depends upon its ability to meet competition from other regions, notably the south, and from foreign countries.

The production of sulphite pulp from jack pine by the ordinary procedure presents certain difficulties generally attributable to the heartwood. Under the ordinary procedure the heartwood is not completely reduced to pulp, so that a relatively large amount of screen rejections and a low yield of pulp result. In the past, some jack pine has been used for the production of newsprint pulp. The results, however, have been somewhat unsatisfactory owing to these heartwood difficulties.

Experiments at the Forest Products Laboratory have recently indicated the possibility of much improved results with reasonably complete reduction of the wood by employing the customary calcium bisulphite liquor containing a relatively high sulphur dioxide concentration and a longer cooking time at lower temperatures.

For the application of practical cutting methods to obtain the maximum value from existing stands of jack pine, data on the volume of pulpwood, the costs, and the ultimate yield and quality of the pulp, as affected by different methods of cutting, are required. Other silvicultural factors to be considered are the annual growth, the mortality, and the reproduction as affected by cutting methods. The most effectual use of jack pine pulpwood requires a thorough knowledge of its pulping characteristics and corresponding wood properties and the application of suitable pulping techniques. Such data should also be of considerable value in predicting costs and returns from actual stands before cutting.

To determine the most effective cutting methods for jack pine pulpwood, the Division of State and Private Forestry of the north central region of the U. S. Forest Service, Milwaukee, Wis., recently conducted selective cutting experiments in cooperation with the State of Minnesota and a paper company. Cost and volume studies were made on approximately 400 cords of each of four degrees of cutting (approximately 30, 40, 60 per cent and clear cutting) from a 48-year-old even-aged stand grown under natural conditions. Further studies are planned to determine the annual growth, the mortality, and the reproduction on each of the thinned plots over a 10-year period. Photographs showing the stands before cutting and after various degrees of cutting are shown in Figs. 1 to 3, inclusive.

To enable accurate determination of the ultimate conversion value for each degree of cutting, physical

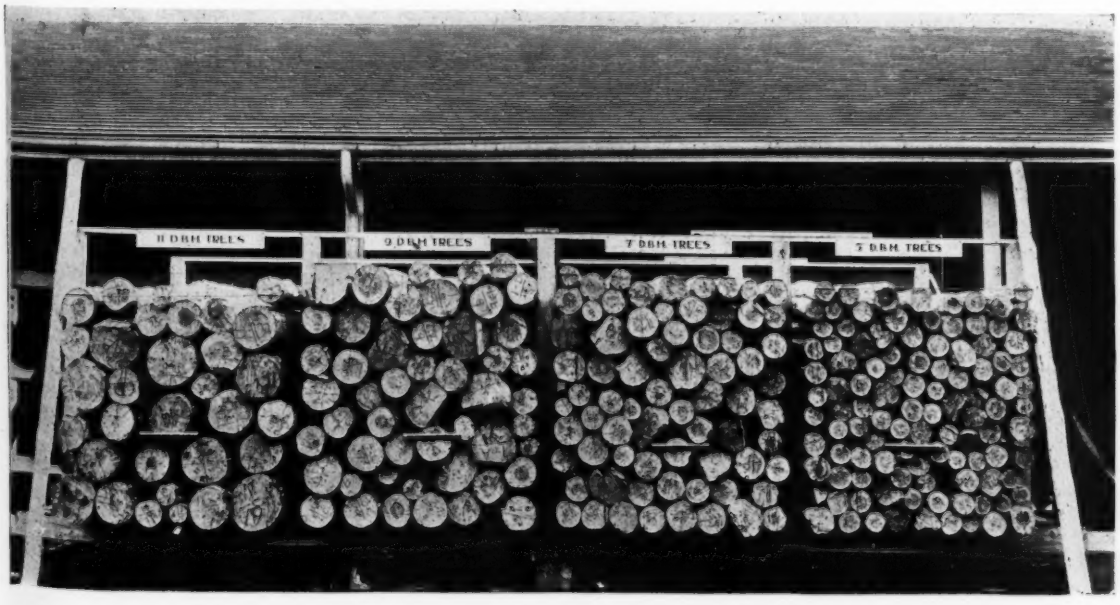

FIG. 4.
Racks of 8-foot bolts from 5-, 7-, 9-, and 11-inch diameter breast height jack pine trees.

and chemical measurements and pulp yield and quality determinations were made at the Forest Products Laboratory on selected samples of the wood.

Material Used

Pulping data were obtained on samples of about one cord each of 8-foot bolts from trees of several diameter classes (5, 7, 9, 11 inches d.b.h.), shown in Fig. 4. The top, middle, and butt bolts of the sample cords of each diameter class were segregated and representative samples of each were taken for the pulping experiments. These samples are described in detail in Table I. The wood properties and the yield and quality of pulp were determined for each of the segregated samples. The data thus obtained can be applied to different degrees of cutting on similar age classes and site qualities when the amount of wood in each diameter class is known. In addition to the sample cords from different sized trees, one cord of bolts 3 to 4 inches in diameter and 8 feet in length was taken above the merchantable tops of woods-run material and included in the experiments.

The physical and chemical properties of the wood are given in Tables II, III and IV. The density, summerwood content, and heartwood content of the wood were found to decrease with increasing height in the tree. These properties, in general, also decreased with increasing diameter breast height. The

TABLE I.—SAMPLES SELECTED FOR PHYSICAL, CHEMICAL, AND PULPING TESTS JACK PINE SHIPMENT 1504

Diameter breast height class	Butt logs sample	Middle logs sample [1]	Top logs sample
5 inch	Butt 8-foot logs of trees, 2, 6, 10, 14, 18, 22, 26, 30, 34, 38, 44.	8-foot logs from the 17 trees containing 3 logs to the tree.	8-foot top logs from same trees chosen for butt logs.
7 inch	All 8-foot butt logs.	All 8-foot middle logs,	All 8-foot top logs.
9 inch	One-quarter sawed lengthwise from each of the two sections comprising the butt logs of all trees, the quarters chosen from the upper and lower sections being from opposite sides of the log.	One-half sawed lengthwise from each of the two sections comprising the middle logs of all trees, the halves chosen from the upper and lower sections being from opposite sides of the log.	All 8-foot top logs.
11 inch	Same as 9 inch.	Same as 9 inch.	Same as 9 inch.
3-4 inch diameter top logs.....	Every third log in the cord taken at random.		

[1] The middle 8-foot section of trees containing an even number of logs was selected by taking the 4-foot sections above and below the midpoint of the portion of the trunk received.

TABLE II.—CORD DATA FOR JACK PINE TREES

Diameter breast height class Inches	Quantities per unbarked cord: No. of bolts, (8-foot)	Solid wood content, Cubic feet	Weight wood (oven-dry) Pounds	Racked volume barked, Cord	Crooked bolts, Per cent	Cat-faced bolts, Per cent
5	91	76.8	2,010	0.91	67	24
7	61	80.5	2,040	.91	68	13
9	41	79.7	1,940	.93	68	4
11	31	83.2	1,960	.93	97	9
3 to 4 tops	120	78.9	1,860	.88	75	3

TABLE IV.—CHEMICAL ANALYSES OF JACK PINE PULPWOOD, SHIPMENT 1504

Diameter breast height class, inches	Position of logs in tree	Alpha cellulose, per cent	Cellulose, per cent	Lignin, per cent	Pentosans: Total, per cent	Pentosans: In cellulose, per cent	Solubility: Alcohol benzene, per cent	Solubility: Ether, per cent	Solubility: 1% NaOH, per cent	Solubility: Hot water, per cent
5	Top	42.1	58.3	27.9	14.1	11.6	3.7	3.3	12.6	3.7
	Middle	45.0	59.5	27.1	13.5	11.7	3.1	1.9	12.7	2.6
	Butt	42.5	57.6	26.7	13.5	11.3	4.6	3.5	13.3	3.5
7	Top	42.5	56.8	28.0	14.0	10.9	3.8	3.1	13.1	3.0
	Middle	42.2	57.5	27.2	13.9	10.7	4.3	2.8	13.1	3.0
	Butt	42.2	58.2	26.9	12.8	10.8	4.6	2.4	13.6	3.1
9	Top	42.7	56.0	27.6	14.0	10.8	3.6	3.1	13.5	2.8
	Middle	41.5	58.1	27.0	14.2	10.9	4.0	3.2	12.6	3.0
	Butt	40.8	57.0	26.0	12.9	11.1	5.9	4.9	15.5	3.5
11	Top	40.9	55.9	26.4	14.1	11.8	4.5	4.1	13.6	2.9
	Middle	40.3	57.1	26.6	14.2	11.4	4.6	3.6	13.2	3.2
	Butt	40.2	56.6	25.6	11.3	9.9	7.5	5.7	16.8	4.4
Averages for Entire Merchantable Trunks [1]										
5		42.8	58.2	27.1	13.7	11.5	4.0	3.2	13.0	3.4
7		42.3	57.7	27.3	13.5	10.8	4.3	2.7	13.4	3.1
9		41.4	57.2	26.6	13.5	11.0	4.9	4.0	14.2	3.2
11		40.3	56.6	26.0	12.6	10.7	6.1	4.8	15.2	3.8
Averages for top, middle, and butt bolts										
3 to 4	Top	40.6	57.8	26.6	13.8	12.2	3.9	2.6	13.4	3.6
5, 7, 9, 11	Top	42.0	56.8	27.5	14.0	11.3	3.9	3.4	13.2	3.1
5, 7, 9, 11	Middle	42.2	58.0	27.0	14.0	11.2	4.0	2.9	12.9	3.0
5, 7, 9, 11	Butt	41.4	57.4	26.3	12.6	10.8	5.6	4.1	14.8	3.6

[1] Weighted averages computed from above analyses of tops, middles and butts.

TABLE III.—PHYSICAL PROPERTIES OF JACK PINE TREES RANGING FROM 5 TO 11 INCHES DIAMETER BREAST HEIGHT AND OF 3- TO 4-INCH DIAMETER TOP BOLTS

Diameter breast height class, Inches	Position in tree	No. of bolts	Part of total by weight, Per cent	Crooked bolts, Per cent	Disc data: Diameter, Inches	Age, Years	Growth rate, Rings per inch	Specific gravity Oven-dry per green volume	Density weight Pounds per cu. ft.	Oven-dry wood substance, Per cent	Proportion by volume: Heartwood, Per cent	Summerwood, Per cent	Compression wood: Mild, Per cent	Compression wood: Pronounced Per cent
5	Top [2] ...	11	8.8	82	4.1	33.4	16.7	0.410	25.6	60.0	33.4	23.5	8.5	0
5	Middle ..	17	16.8	65	4.5	36.9	16.5	.413	25.6	59.6	35.3	25.6	8.6	3.5
5	Butt [2] ...	11	11.9	73	4.7	39.6	16.9	.434	27.2	63.2	40.3	26.2	6.5	4.7
7	Top	17	16.6	71	4.6	24.8	10.8	.382	23.8	48.3	16.3	20.8	.9	0
7	Middle ..	17	23.9	65	5.5	34.5	12.5	.399	24.9	53.3	29.1	23.7	5.9	0
7	Butt	17	31.6	82	6.3	41.2	13.0	.428	26.8	54.3	29.5	28.0	14.9	0
9	Top	10	10.6	100	4.8	23.6	9.9	.372	23.2	44.3	11.8	20.4	1.9	0
9	Middle ..	10	20.3	60	6.7	33.9	10.2	.383	23.9	50.7	29.1	22.9	1.8	0
9	Butt	10	29.7	70	8.1	41.7	10.3	.406	25.3	52.2	34.8	25.2	8.2	0
11	Top	6	7.3	100	5.0	18.2	7.2	.376	23.5	45.1	3.8	21.8	4.6	7.7
11	Middle ..	6	18.2	100	7.9	30.8	7.9	.372	23.2	47.0	24.4	22.8	8.8	0
11	Butt	6	29.4	100	10.0	41.5	8.3	.398	24.8	50.6	29.4	25.4	1.5	4.7
Averages for entire merchantable trunks [1]														
5	.....	..	...	...	4.4	37.2	16.9	.418	26.2	61.4	36.8	25.2	9.3	1.7
7	.....	..	...	...	5.5	33.5	12.2	.406	25.3	52.1	26.8	24.5	7.8	0
9	.....	..	...	...	6.5	33.0	10.1	.390	24.4	49.3	29.4	23.1	5.3	0
11	.....	..	...	...	7.7	30.2	7.9	.378	23.6	47.8	14.3	23.4	4.1	2.0
Averages for top, middle, and butt bolts														
3 to 4	Top [2]	..	...	...	3.7	19.9	10.8	.376	23.5	52.5	10.1	20.0	2.8	.6
5, 7, 9, 11	Top	..	...	...	4.6	25.0	11.2	.385	24.0	49.4	16.3	21.6	4.0	1.9
5, 7, 9, 11	Middle ..	..	...	...	6.2	34.0	11.8	.392	24.4	52.6	29.5	23.8	6.3	.9
5, 7, 9, 11	Butt	..	...	...	7.3	41.0	12.1	.416	26.0	55.1	33.5	26.2	7.8	2.4

[1] Data obtained from the entire cord samples including intermediate 8-foot bolts.
[2] Eight-foot sticks above merchantable tops.
[3] Data for only those bolts taken for pulping.

TABLE V.—RESULTS OF SULPHATE DIGESTIONS OF TOP, MIDDLE, BUTT AND 3- TO 4-INCH TOP PORTIONS OF JACK PINE (PINUS BANKSIANA) TREES RANGING FROM 5 TO 11 INCHES IN DIAMETER AT BREAST HEIGHT

Wood used: Diameter breast height class, inches	Position in tree	Cooking[1] and yield data: Moisture,[2] per cent	Chemicals consumed: Ratio of combined to total alkali, per cent	Chemicals consumed: Based on oven-dry wood charged, per ct.	Chemicals consumed: Total effective alkali as Na_2O, per cent	Average yield of pulp: Density of black liquor at 15° C., °Bé.	Average yield of pulp: Oven dry: Per 100 pounds oven-dry wood: Screened, pounds	Average yield of pulp: Oven dry: Per 100 pounds oven-dry wood: Screenings, pounds	Average yield of pulp: Oven dry: Per 100 pounds oven-dry wood: Total, pounds	Average yield of pulp: Oven dry: Per cubic ft. of wood, screened, pounds	Average yield of pulp: Oven dry: Per cord (8 ft. wood), screened, pounds	Average yield of pulp: Air dry: Per cord (8 ft. wood), screened, pounds	Interpolated beater strength data: Tests made at 75 deg. F. and 65 per cent relative humidity: Burst factor: Freeness—S. R. 700 cc.: Points per pound per ream (25 x 40—500)	Burst factor: Freeness—S. R. 550 cc.: Points per pound per ream (25 x 40—500)	Tear factor: Freeness—S. R. 700 cc.: Points per pound per ream (25 x 40—500)	Tear factor: Freeness—S. R. 550 cc.: Points per pound per ream (25 x 40—500)	Tensile strength: Freeness—S. R. 700 cc.: Pounds per square inch	Tensile strength: Freeness—S. R. 550 cc.: Pounds per square inch	Solid fraction: Freeness—S. R. 700 cc.: Ratio	Solid fraction: Freeness—S. R. 550 cc.: Ratio	Bleach data: Ives color readings with 25 per cent bleach powder (single-stage): Red, parts	Green, parts	Blue, parts	Cellulose: Total, per cent	Alpha, per cent	Chemical analysis of pulps: Lignin, per cent	Total pentosans, per cent	Chlorine number (Roe), per cent
5	Top	33.3	85.2	17.0	14.3	10.6	46.9	0.6	47.5	11.85	....	....	1.45	1.51	2.00	1.73	7,800	9,300	0.47	0.50	79	65	51	92.7	75.8	3.2	11.3	2.7
5	Middle	27.1	86.5	17.3	14.5	11.0	47.3	.4	47.7	12.10	....	....	1.36	1.39	1.62	1.32	8,800	10,300	.48	.52	83	71	57	93.5	77.0	4.5	11.8	5.6
5	Butt	18.5	84.9	16.9	14.2	10.6	46.2	.3	46.5	12.30	....	....	1.24	1.26	1.50	1.24	8,500	9,900	.50	.54	80	67	54	92.2	75.5	4.9	10.7	5.2
7	Top	45.6	85.2	17.0	14.3	10.8	47.4	.3	47.7	11.30	....	....	1.54	1.60	1.88	1.67	9,350	11,450	.52	.54	80	64	50	92.8	74.8	4.8	11.2	5.7
7	Middle	21.3	85.9	17.1	14.4	11.1	47.5	.5	48.0	11.80	....	....	1.34	1.35	1.64	1.36	8,950	10,250	.48	.51	80	66	53	92.8	77.1	4.3	11.6	4.0
7	Butt	21.3	84.4	16.8	14.1	10.6	47.1	.4	47.5	12.62	....	....	1.31	1.32	1.70	1.44	8,450	10,000	.50	.54	85	70	57	92.4	77.8	4.5	10.7	5.1
9	Top	51.5	86.6	17.3	14.5	10.6	46.8	.6	47.4	10.86	....	....	1.50	1.58	1.72	1.50	9,150	10,400	.49	.53	82	71	58	93.4	75.8	4.2	11.5	5.5
9	Middle	33.8	86.2	17.2	14.4	10.6	46.9	.7	47.6	11.21	....	....	1.49	1.56	1.72	1.49	8,900	10,450	.49	.53	81	68	55	92.3	75.4	4.2	11.0	5.1
9	Butt	18.0	85.7	17.1	14.4	10.6	46.1	.5	46.7	11.67	....	....	1.23	1.25	1.52	1.22	8,100	9,500	.50	.54	82	68	55	91.2	77.2	4.8	10.3	5.5
11	Top	52.2	86.5	17.3	14.5	10.5	45.3	.4	45.7	10.66	....	....	1.36	1.43	1.66	1.43	9,150	11,000	.51	.56	82	69	57	93.2	76.2	4.2	11.6	5.2
11	Middle	39.6	86.2	17.2	14.4	10.6	46.8	.6	47.4	11.85	....	....	1.43	1.52	1.80	1.62	8,000	9,150	.49	.53	81	68	54	93.5	77.0	4.0	11.6	3.9
11	Butt	19.4	85.4	17.0	14.3	10.5	45.7	.7	46.4	11.35	....	....	1.18	1.22	1.60	1.32	9,000	10,550	.53	.56	81	67	54	92.9	77.4	4.1	10.9	5.1
AVERAGE[3] FOR ENTIRE MERCHANTABLE TRUNK																												
5		...	85.3	17.0	14.3	10.7	46.4	.4	46.8	12.11	935	1,037	1.33	1.37	1.69	1.42	8,308	9,829	.49	.52	80	67	53	92.6	75.9	4.2	11.1	4.4
7		...	85.1	16.9	14.2	10.8	47.3	.4	47.7	12.04	965	1,071	1.37	1.39	1.72	1.47	8,823	10,417	.50	.53	82	67	54	92.6	76.9	4.5	11.1	4.9
9		...	86.0	17.2	14.4	10.6	46.5	.6	47.1	11.37	902	1,001	1.36	1.41	1.62	1.36	8,552	9,976	.49	.53	82	69	56	92.0	76.4	4.5	10.7	5.4
11		...	85.8	17.1	14.4	10.5	46.0	.6	46.6	11.42	901	1,000	1.29	1.35	1.67	1.43	8,688	10,146	.51	.55	81	68	54	93.1	77.1	4.1	11.2	4.7
AVERAGE[3] FOR POSITION IN TREE																												
3 to 4	Top	18.1	85.2	17.0	14.3	10.7	47.3	.4	47.7	11.12	880	978	1.37	1.40	1.50	1.23	11,000	12,500	.55	.60	82	68	55	92.1	75.3	4.5	11.4	5.1
	Top	...	85.9	17.2	14.4	10.6	46.4	.5	46.9	11.17	893	993	1.46	1.53	1.82	1.58	8,862	10,588	.50	.53	81	67	54	93.0	76.4	4.1	11.4	4.8
	Middle	...	86.2	17.2	14.4	10.8	47.1	.6	47.7	11.74	939	1,044	1.40	1.46	1.70	1.45	8,662	10,038	.48	.52	81	68	55	93.0	76.6	4.2	11.5	4.6
	Butt	...	85.1	17.0	14.2	10.6	46.3	.5	46.8	11.98	958	1,065	1.24	1.26	1.58	1.30	8,512	9,988	.51	.54	82	68	55	92.2	77.0	4.6	10.6	5.2

[1] All digestions were made in 3.7 gallons, steam-jacketed, spherical rotary autoclaves heated with indirect steam. The cooking conditions other than those shown are as follows:

Concentration of cooking chemicals		Chemicals added per hundred pounds of oven-dry wood:		Volume of liquor (including moisture in chips) per hundred pounds of oven-dry wood	48.0 gallons
Sodium hydroxide (calculated as NaOH)	33.3 grams per liter	Sodium hydroxide (calculated as NaOH)	13.33 pounds	Liquor-wood ratio	4:1
Sodium sulphide (calculated as Na_2S)	16.7 grams per liter	Sodium sulphide (calculated as Na_2S)	6.67 pounds	Maximum digestion temperature	170 deg. C.
Total chemicals	50.0 grams per liter	Total chemicals	20.00 pounds	Temperature-pressure increase period	1½ hours
		Total effective alkali (calculated as NaOH)	16.75 pounds	Duration at maximum temperature	1½ hours

[2] Based on moist weight of wood.
[3] Weighted averages computed from the results from tops, middles, and butts. The values for yield per cubic foot and per cord of wood were calculated from the weighted average yield in pounds of pulp per 100 pounds of wood, the density determined from the entire cord sample and the weight of wood, oven dry per cord.
[4] Calculated from an assumed volume of 80 cubic feet of solid wood per cord.

weight of wood per cord decreased slightly with increasing diameter breast height; the lower density of the larger trees more than counteracted the effect of the greater volume of solid wood per cord.

In general, little relationship was noted between the chemical properties and the position of the wood in the tree. However, with increase in diameter breast height the cellulose, alpha cellulose, lignin, and pentosans were lower and the extractives were higher.

The various samples were prepared for cooking in the usual manner by shipping, screening, and mixing thoroughly to obtain representative samples of 5/8-inch chips. The chips were kept in covered cans in a cold room until used.

Sulphate digestions were made in triplicate under identical conditions in spherical, steam-jacketed, rotary autoclaves of 3.7 gallons capacity.

The chips were cooked with a total of 20 per cent, of their oven-dry weight, of a mixture of caustic soda and sodium sulphide in the ratio of two parts by weight of the former to one part of the latter. A linear temperature-pressure schedule was followed, allowing 1½ hours to raise the temperature of the autoclave from that of the room to the maximum of 170 deg. C., where it was held constant for an equal period, making a total cooking cycle of 3 hours.

Sulphite digestions were made in duplicate or triplicate by suspending chips contained in perforated baskets, in a 50-pound

pulp capacity digester. The cooking conditions were determined by application as far as possible of the conditions previously found suitable for a commercial mill operation. After the main series was completed further tests were made to determine the time necessary for complete reduction of all types of wood.

In all digestions of the first series, therefore, the cooking liquor contained approximately 6.5 per cent total sulphur dioxide with 1.25 per cent combined. Approximately 75 gallons were charged per 100 pounds of wood. The maximum pressure was 80 pounds per square inch. The temperature schedule was as follows:

		Hours
Time to 110 deg. C.		1.5
Time at 110 deg. C.		2.0
Time from 110 deg. C. to 136 deg. C.		4.5
Time at 136 deg. C.	3- to 4-inch tops	3.6
	Top	4.3
	Middles	3.8
	Butts	3.8
Total time	3- to 4-inch tops	11.6
	Top	12.3
	Middles	11.8
	Butts	11.8

In each instance the digestions were continued nearly to exhaustion of the bisulphite. The low heartwood content of the tops, together with a higher moisture content, permitted a slightly longer cooking time to give a more complete reduction than was obtained from the middles and butts. The comparatively short time required for the 3- to 4-inch tops was undoubtedly a result of their low moisture content.

Strength tests were made on both sulphate and sulphite pulps according to the standard Forest Products Laboratory beater method. Unbleached sulphate pulps were analyzed for their cellulose, alpha cellulose, lignin, pentosan contents, and their chlorine consumption. Unbleached sulphite pulps were tested for their chlorine consumption, and for their solubility in ether and in an alcohol-benzene mixture.

Sulphate Pulping Data

Although the data (Table V and Fig. 5) show that there are some differences both in yield and in pulp quality, all types of growth pulped equally satisfactorily by the kraft process.

The yields of screened pulp and screenings from the several locations in the trees of different diameter class deviated but little from the general average when considered on a weight basis. When considered on a volume basis, however, considerable variation both as to diameter class and as to position of bolt in the tree may be noticed. Because of the greater density of the suppressed trees and of the lower portions of all the trees, the yields per cubic foot of solid wood were, in general, considerably higher for this material than for the less dense material occurring in the more rapid-growth types and in the upper portions of the trees. On a cord basis the yields of kraft pulps were also appreciably higher for the smaller sizes than for the larger trees.

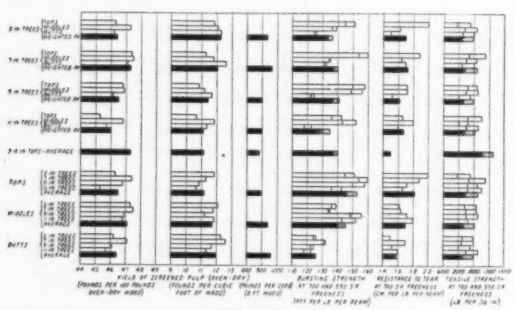

FIG. 5.

Yield and strength of sulphate pulps from top, middle, butt, and 3- to 4-inch top portions of jack pine trees ranging from 5 to 11 inches in diameter at breast height.

The chemical consumed in cooking the different types of wood varied but little from the general average for all the digestions.

Likewise, only small variations were found in the chemical composition and bleach requirement of the kraft pulps. Even though these differences were small, the strength properties of the kraft pulps showed rather wide variations both as to position of bolt in the tree and as to diameter class or growth rate. Position of bolt in the tree with its attendant differences in springwood content, in density, and the like, appeared to play a greater part in determining pulp quality than did growth rate. All the strength properties, including resistance to tear which usually decreases with increase in springwood, showed noticeable improvement in progressing upward in the tree.

Strength Properties

Except for the tearing strength, the same trends in the properties of the pulps were found to apply in a general way to both sulphate and sulphite pulps from jack pine as were previously noted in pulping southern pines, *(1)*, *(2)*, although the range of variation in the springwood content was, in the main, less than 10 per cent. Springwood gave higher bursting and tensile strengths than did summerwood. Because of the collapse to a ribbon-like form of the thin-walled fibers of the springwood, the springwood pulp was more pliable and formed denser sheets having a finer texture, smoother surface, and lower porosity than the summerwood pulp. The low tearing strengths obtained from the butt bolts and the low bursting and tearing strengths obtained from the tops of the largest trees may be indicative of the influence of other factors, such as fiber dimensions or structure.

Pulps from the 7- and 9-inch diameter classes gave the highest average bursting strengths. The lowest tearing strength was obtained from the 9-inch class trees and from the 3- to 4-inch small top bolts. The small top bolts, however, excelled all others in tensile strength of pulps.

Segregation of the wood should be advantageous for the production of kraft pulps to attain maximum yield and quality with regard to specific properties.

Sulphite Pulping Data

Fairly satisfactory results were obtained by the sulphite process from the several types of jack pine with a 12-hour cooking schedule under the conditions employed (Table VI and Fig. 6). The screenings would probably amount to about 3.5 or 4 per cent under these conditions from woods-run material. The relation between the amount of screenings and the heartwood content for the 12-hour schedule is shown in Fig. 7. The general trend toward large amounts of screenings for higher heartwood contents is evident. The amounts of screenings correspond to only 10 to 20 per cent of the heartwood present, more than 80 to 90 per cent having been reduced since a portion of the screenings would result from other sources. Except for the 5-inch trees, the individual diameter classes show fair relationships corresponding to the general trend. The 11-inch trees gave slightly more screenings than the other diameter class material for the same heartwood content.

TABLE VI.—RESULTS OF SULPHITE DIGESTIONS OF TOP, MIDDLE, BUTT, AND 3- TO 4-INCH TOP PORTIONS OF JACK PINE (PINUS BANKSIANA) TREES RANGING FROM 5 TO 11 INCHES DIAMETER AT BREAST HEIGHT

Wood used				Interpolated beater strength data																			
				Average yield of pulp								Burst factor		Tear factor		Tensile strength		Solid fraction		Beating time	
				Oven dry						Solubility		Freeness—S. R.		Freeness—S. R.		Freeness—S. R.		Freeness—S. R.		Freeness—S. R.	
Diameter breast height class, Inches	Position in tree	Oven-dry wood substance, Per cent	Number of digestions	Per 100 pounds oven-dry wood			Per cubic foot of wood Screened Pounds	Per cord (8 ft. wood) Screened Pounds	Air dry Per cord (8 ft. wood) Screened Pounds	Average bleach requirement Per cent	Alcohol-benzene Per cent	Ether Per cent	800 cc.	550 cc.	800 cc.	550 cc.	800 cc.	550 cc.	800 cc.	550 cc.	800 cc.	550 cc.
			Total digestion time, Hours	Screened Pounds	Screenings Pounds	Total Pounds							Points per pound per ream . 25 x 40—500)		Grams per pound per ream		Pounds per square inch				Minutes	
5	Top	66.4	3	12.3	43.8	4.5	48.3	11.2	....	....	12.6	1.6	1.0	0.85	1.04	1.42	0.90	6,700	11,450	0.52	0.66	32	81
5	Middle	78.2	3	11.8	45.6	3.0	48.6	11.7	....	....	11.9	.8	1.2	.76	.92	1.37	.85	6,000	9,400	.49	.63	31	84
5	Butt	81.8	2	11.8	44.0	4.6	48.6	12.0	....	....	13.2	2.4	1.9	.66	.75	1.25	.75	5,000	8,150	.49	.60	37	78
7	Top	55.3	3	12.3	45.0	2.8	47.8	10.7	....	....	9.1	1.9	1.1	.83	1.00	1.45	1.00	6,250	11,150	.51	.64	36	82
7	Middle	73.0	3	11.8	44.4	3.3	47.7	11.1	....	....	10.2	1.8	1.1	.88	1.02	1.37	.94	6,800	9,500	.49	.60	32	68
7	Butt	79.1	2	11.8	45.4	3.5	48.9	11.7	....	....	9.7	1.9	1.4	.71	.85	1.35	.85	5,100	8,500	.49	.60	34	79
9	Top	48.7	3	12.3	45.6	1.4	47.0	10.6	....	....	9.0	2.4	1.2	.82	1.03	1.38	.90	6,350	11,600	.52	.66	34	99
9	Middle	66.2	3	11.8	44.5	3.6	48.1	10.6	....	....	10.3	1.9	1.3	.92	1.02	1.35	.95	6,500	8,650	.48	.56	23	56
9	Butt	81.8	2	11.8	44.2	3.8	48.0	11.2	....	....	11.0	3.0	1.6	.76	.76	1.30	.80	5,000	8,400	.51	.62	40	93
11	Top	47.1	3	12.3	45.3	1.6	46.9	10.7	....	....	8.3	....	1.3	.70	.93	1.38	.85	5,600	10,650	.54	.66	32	81
11	Middle	60.8	3	11.8	44.5	4.0	48.5	10.3	....	....	9.1	4.7	1.7	.88	1.00	1.35	.92	6,150	8,350	.46	.55	24	64
11	Butt	80.6	2	11.8	43.1	5.6	48.7	10.7	....	....	10.3	2.9	2.3	.72	.82	1.30	.90	5,400	8,800	.51	.62	43	93
				Averages[1] for Entire Merchantable Trunks																			
5		75.9	8	12.0	44.2	4.3	48.5	11.6	891	990	12.8	1.9	1.5	.74	.88	1.33	.82	5,760	9,480	.50	.63	34	80
7		71.6	8	11.9	45.0	3.3	48.3	11.4	918	1,020	9.7	1.9	1.2	.79	.94	1.45	.91	5,930	9,570	.49	.61	31	76
9		70.8	8	11.9	44.5	3.3	47.8	10.9	948	1,053	10.4	2.5	1.4	.78	.89	1.33	.87	5,740	9,040	.50	.61	33	82
11		69.6	8	11.9	43.9	4.5	48.4	10.4	865	961	9.6	[2]3.6	2.0	.77	.89	1.33	.90	5,680	8,900	.50	.60	35	82
				Averages for Position in Tree																			
3 to 4	Top	83.0	4	11.6	45.8	1.2	47.0	10.8	852	947	8.8	1.4	1.7	.83	1.04	1.30	.82	6,450	10,600	.50	.62	35	87
	Top	54.4	12	12.3	44.9	2.6	47.5	10.8	[2]864	960	9.8	2.0	1.2	.80	1.00	1.41	.94	6,225	11,210	.52	.66	34	86
	Middle	69.6	12	11.8	44.7	3.5	48.2	10.9	[2]872	969	10.4	2.3	1.4	.86	.99	1.41	.92	6,360	9,075	.49	.58	26	68
	Butt	80.8	8	11.8	44.2	4.4	48.6	11.4	[2]912	1,013	11.0	2.6	1.8	.69	.80	1.30	.82	5,125	8,450	.50	.61	37	86

[1] Weighted averages computed from the results from tops, middles, and butts. The values for yield of screened pulp per cubic foot and per cord of wood were calculated from the weighted average yield in pounds of pulp per 100 pounds of wood, the density determined from the entire cord sample, and the weight of wood, oven dry, per cord.

[2] Based on middles and butts only.

[3] Calculated from an assumed value of 80 cubic feet of solid wood per cord.

Increasing the schedule to 15.5 hours with a corresponding decrease in temperature should reduce the screenings from woods-run material to less than 1.5 per cent (Table VIII). Butt bolts were chosen to show this effect since they contained more heartwood and were generally the most difficult to reduce. The butt bolts of the 11-inch trees were not completely reduced under these conditions, but would represent only a small portion of any cutting. Segregation of the wood would also be advantageous in decreasing the percentage of screenings.

Although the differences in the yields of screened sulphite pulp on a weight basis from the different sized trees in the shorter cooking time were not large, slightly higher yields and smaller amounts of screenings were obtained from the two intermediate diameter classes than from the two extremes when the average values are considered (Table VI and Fig. 6). The yield of pulp per cubic foot of solid wood decreased as the diameter (rate of growth) increased; the yield from the largest trees was approximately 10 per cent lower than from the smallest. On a cord basis the yields from the two intermediate sizes were appreciable higher than from the two extremes.

The differences in the strength of the sulphite pulps obtained from the different diameter classes were slight. The ether extractives, indicative of the pitch content, were somewhat lower for the two intermediate classes.

It is believed that the results of both kraft and sulphite pulping for the diameter classes examined (5-, 7-, 9-, and 11-inch diameter breast height) can be applied with reasonable accuracy to different degrees of cutting on similar age classes and site qualities where the amount of good in each diameter class is known. However, any application of the cord data may necessitate adjustment in the values for solid wood content.

On the whole, greater differences were exhibited by the sulphite pulp as well as the kraft obtained from different portions of the trees than by those obtained from the different diameter classes. While exceptions may be noted in certain diameter classes, the following general trends are evident in the average values: The yield of sulphite pulp on a weight basis decreased from the tops to the butts and the amount of screenings increased appreciably. The yield on a volume basis increased from the tops to the butts. The strength of the pulps from the butt bolts was appreciably lower than from the middles or tops, while the solubility values were higher.

TABLE VII.—COMPARISON OF PULPS FROM TOP, MIDDLE, AND BUTT BOLTS FROM 7-INCH JACK PINE—17-HOUR SCHEDULE[1]

Position in tree	Yield: Screened pulp, per cent	Yield: Screenings, per cent	Bleach requirement, per cent	Ives color analysis unbleached pulp (white), per cent	Burst factor at 550 cc. freeness, points per lb. per ream	Tear factor at 550 cc. freeness, grams per lb. per ream	Solubility: Alcohol-benzene, per cent	Solubility: Ether, per cent
Top	46.5	1.3	9.0	60	1.15	0.87	1.7	0.9
Middle	47.1	1.3	9.6	62	1.01	.90	1.9	1.1
Butt	47.1	1.7	10.2	68	.88	.90	2.3	1.5

[1] Acid composition—6.5 per cent total SO_2, 1.25 per cent combined SO_2; penetration—1.5 hours to 110 deg. C., held at 110 deg. C. for 2 hours; maximum temperature—127 deg. C.; time to maximum temperature—10.5 hours; total time—17.0 hours; maximum pressure—80 pounds per square inch.

TABLE VIII.—EFFECT OF TEMPERATURE SCHEDULE[1] IN PULPING JACK PINE BUTT BOLTS BY THE SULPHITE PROCESS

Diameter breast height class, inches	Yield: Screened pulp, per cent	Yield: Screenings, per cent	Bleach requirement, per cent	Ives color analysis unbleached pulp (white), per cent	Burst factor at 550 cc. freeness, points per lb. per ream	Tear factor at 550 cc. freeness, grams per lb. per ream	Solubility: Alcohol-benzene, per cent	Solubility: Ether, per cent
Total time—11.8 hours; maximum temp.—136 deg. C.; time to maximum temp.—8.0 hours								
5	44.0	4.6	12.8	60	0.75	0.75	2.4	1.9
7	45.4	3.5	10.0	64	.84	.85	1.9	1.4
9	44.2	3.8	10.6	64	.76	.80	3.0	1.6
11	43.1	5.6	9.7	64	.82	.90	2.9	2.3
Total time—15.5 hours; maximum temp.—130 deg. C.; time to maximum temp.—10.5 hours								
5	46.7	1.8	12.2	63	.89	.78	3.6	2.2
7	47.6	1.3	10.2	68	1.00	.85	3.3	3.2
9	47.7	1.5	10.8	64	.89	.80	4.8	3.6
11	45.0	3.6	10.8	63	.82	.85	4.5	2.8
Total time—17.0 hours; maximum temp.—127 deg. C.; time to maximum temp.—10.5 hours								
7	47.1	1.7	10.2	68	.88	.90	2.3	1.5
11	44.9	4.8	10.6	67	.94	.90	2.6	1.7

[1] Acid composition—6.5 per cent total SO_2, 1.25 per cent combined SO_2; penetration—1.5 hours to 110 deg. C., held 2 hours at 110 deg. C.; maximum pressure—80 pounds per square inch.

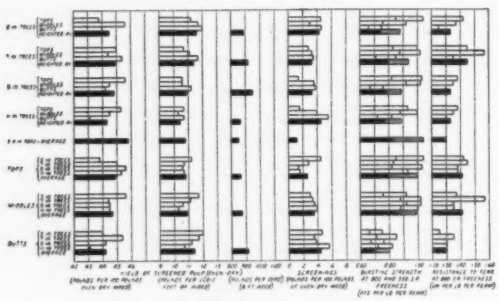

FIG. 6.

Yield and strength of sulphite pulps from top, middle, butt, and 3- to 4-inch top portions of jack pine trees ranging from 5 to 11 inches in diameter at breast height.

Table VII gives the results of a sulphite digestion of different portions of the 7-inch trees with a cooking time sufficient to give reasonable reduction of all samples except the butt portion of the 11-inch trees. Except for the yield, which was slightly lower from the tops than from the middles or butts, the trends were similar to those obtained in the shorter cooking time. However, the strength of the pulp was somewhat higher and the bleach requirement and extractives lower than were obtained with the 12-hour schedule.

Although fairly complete reduction of the majority of the samples was obtained with the 12-hour schedule, the most desirable wood for sulphite pulping consisted of the top portions of the larger trees.

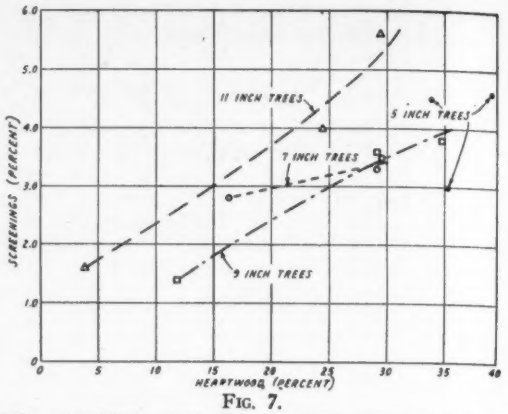

FIG. 7.

Relation of sulphite screenings to heartwood content of jack pine (12-hour schedule).

The middle portions of the smaller trees might be a second choice. The small tops below merchantable size gave perhaps the best results with respect to yield on a weight basis, amount of screenings, and bursting strength. However, the yield on a cord basis was low as a result of the low density, and the cost of preparation would undoubtedly be higher than for the regular merchantable sizes.

Segregation for sulphite pulping according to diameter class should give slightly better results from the intermediate sizes than from the two extremes with respect to the yield on a cord basis, strength, and amount of screenings. This segregation would be slightly less advantageous than a selection of tops or including some of the middles, from the standpoint of strength and screenings, but would give a slightly higher yield on a cord basis.

Literature Cited

(1) Bray, M. W., and Curran, C. E. Paper Trade J. *105* (20) 39, November 11, 1937.

(2) Chidester, G. H., McGovern, J. N., and McNaughton, G. C. Paper Trade J. *107* (4) 32, July 28, 1938.

TAPPI Notes

The Ohio Section of the Technical Association of the Pulp and Paper Industry will meet with the Miami Valley Division of the Superintendents Association at the Manchester Hotel, Middletown, Ohio on Saturday evening, October 14, 1939. This will be a testimonial dinner to George H. Harvey of the Gardner-Richardson Company.

The Southern States Pulp and Paper Club will meet at the Francis Marion Hotel, Charleston, S. C. on October 21, 1939. The program will consist of a symposium on bleaching processes and equipment. A visit will be made to the mill of the West Virginia Pulp and Paper Company.

The Pacific Section of TAPPI will hold meetings during the coming year as follows: October 3rd at Seattle, Wash.; November 7 at Camas, Wash.; January 9 at Tacoma, Wash.; February 6 at Everett, Wash.; March 5 at Portland, Ore. and on May 4 at Vancouver, B. C. The Section will be host to the national convention of TAPPI in August 1940.

O. E. S. Hedbring, 234 Broad Street, Georgetown, S. C. would like to purchase a copy of Technical Association Papers, Series XVII (1934).

To permit more up to date printing of abstracts of papermaking in the future, articles appearing in American paper trade magazines will be mentioned by title only.

Imports of Paper and Paper Stock

Giving Manifests of New York, Boston, Philadelphia and Other Ports of Newsprint, Wrapping, Writing, Coated, Blotting, Tissue, Strawboard, Wallboard, Cigarette Papers, Sulphite, Kraft and Ground Wood Pulp.

NEW YORK IMPORTS

WEEK ENDING SEPTEMBER 23, 1939

SUMMARY

Cigarette paper.....146 cs.
Wall paper.....8 bxs.
Wall board.....3,325 bdls.
Newsprint.....16,057 rolls, 793 bdls.
Printing paper.....12 rolls
Filter paper.....78 bls.
Drawing paper.....45 cs.
Basic paper.....59 cs.
Parchment paper.....11 cs.
Tissue paper.....141 bbls.
Miscellaneous paper.....9 cs.

CIGARETTE PAPER

American Tobacco Co., *Pipestone County,* Bordeaux, 131 cs.
H. H. Strauss, *Pipestone County,* Bordeaux, 15 cs.

WALL PAPER

S. K. Lonegren, *Drottningholm,* Gothenburg, 8 bxs.

WALL BOARD

Treetex Corp., *Brosund,* Ornskoldsvik, 3,325 bdls.

NEWSPRINT

——, *City of Flint,* Glasgow, 128 rolls.
News Syndicate Co., Inc., *Ringar,* Comeau Bay, 7,046 rolls.
N. Y. Evening Journal, *Markland,* Liverpool, N.S., 592 rolls.
N. Y. Tribune, *Markland,* Liverpool, N.S., 3,416 rolls.
Brooklyn Daily Eagle, *Markland,* Liverpool, N.S., 525 rolls.
World Telegram, *Markland,* Liverpool, N.S., 581 rolls.
Washington Post, *Markland,* Liverpool, N.S., 140 rolls.
H. G. Craig Co., Inc., *Donpaco,* Donnacona, 276 rolls.
Jay Madden Corp., *Carolina Thorden,* Helsingfors, 559 rolls.
H. Reeve Angel & Co., Inc., *Carolina Thorden,* Kotka, 457 rolls.
Jay Madden Corp., *Carolina Thorden,* Kotka, 1,341 rolls.
Jay Madden Corp., *Scanyork,* Wiborg, 377 rolls.
Street & Smith Publications, *Wacosta,* Glasgow, 156 rolls.
——, *Fort Amherst,* Cornerbrook, 39 rolls, 793 bdls.
Perkins Goodwin & Co., *Drottningholm,* Gothenburg, 192 rolls.
Nolan Bowmall & Co., Inc., *Drottningholm,* Gothenburg, 70 rolls.
Lunham & Reeve, Inc., *Mormachawk,* Kotka, 162 rolls.

PRINTING PAPER

Keuffel & Esser Co., *Blommersdyk,* Rotterdam, 12 rolls.

FILTER PAPER

J. Manheimer, *Aquitania,* Southampton, 78 bls.

DRAWING PAPER

Favor Ruhl & Co., *Pr. Harding,* Havre, 1 cs.
Keuffel & Esser Co., *Blommersdyk,* Rotterdam, 44 cs.

BASIC PAPER

R. Wilson Paper Corp., *Black Tern,* Antwerp, 55 cs.
——, *Volendam,* Rotterdam, 4 cs.

PARCHMENT PAPER

Atkinson Haserick & Co., *Black Tern,* Antwerp, 11 cs.

TISSUE PAPER

Jay Madden Corp., *Scanyork,* Helsingfors, 141 bbls.

MISCELLANEOUS PAPER

——, *Nankai Maru,* Kobe, 4 cs.
Dingelstedt & Co., *Blommersdyk,* Rotterdam, 5 cs.

RAGS, BAGGINGS, ETC.

Irving Trust Co., *City of Flint,* Glasgow, 37 bls. rags.
W. Steck & Co., *Scanyork,* Copenhagen, 182 bls. bagging.
——, *Scanyork,* Copenhagen, 60 bls. rags.
Castle & Overton, Inc., *Pipestone County,* Havre, 31 bls. rags.
R. Blank, *Pipestone County,* Havre, 215 bls. rags.
E. J. Keller Co., Inc., *Exochorda,* ——, 81 bls. bagging.
W. Steck & Co., *Exochorda,* Alexandria, 49 bls. bagging.
J. Levy & Son, *Oriente,* Havana, 22 bls. rags.
——, *Oriente,* Havana, 108 bls. rags.
——, *Gertrud,* Jaffa, 183 bls. old jute, 534 bls. rags.
J. T. Flannery, *Gertrud,* Alexandria, 418 bls. rags.

HIDE CUTTINGS, ETC.

——, *American Shipper,* Liverpool, 524 bags hide cuttings, 268 bags old pickers.

OLD ROPE

W. Steck & Co., *City of Flint,* Glasgow, 52 coils.

CASEIN

National City Bank, *Mormacsun,* Buenos Aires, 417 bags.
American & British Chemical Supplies, *Mormactide,* Buenos Aires, 4,000 bags, 200,000 kilos.
——, *Mormacrey,* Buenos Aires, 1,768 bags, 106,080 kilos.
American & British Chemical Supplies, *Mormacrey,* Buenos Aires, 1,000 bags, 50,000 kilos.
National City Bank, *Mormacrey,* Buenos Aires, 1,418 bags, 85,080 kilos.
American & British Chemical Supplies, *Black Heron,* Antwerp, 313 bags.

WOOD PULP

Guaranty Trust Co., *Georgia,* Gothenburg, 600 bls. dry sulphate, 102 tons.
Bankers Trust Co., *Georgia,* Gothenburg, 3,000 bls. dry sulphate, 510 tons; 300 bls. sulphite, 60 tons; 500 bls. bleached wood pulp, 101 tons.
Bulkley Dunton Pulp Co., Inc., *Scanyork,* ——, 1,110 bls. dry sulphite, 187 tons.
Pulp Sales Corp., *Scanyork,* Wiborg, 3,268 bls. wood pulp, 653 tons.
Castle & Overton, Inc., *Vigrid,* Gdynia, 450 bls. wood pulp, 45 tons.
Pulp Sales Corp., *Mormachawk,* Helsingfors, 750 bls. sulphite, 150 tons.
Pulp Sales Corp., *Mormachawk,* Kovisto, 1,433 bls. mech. ground pulp, 279 tons.
Pulp Sales Corp., *Mormachawk,* Kotka, 780 bls. sulphate.

WOOD PULP BOARDS

Jay Madden Corp., *Carolina Thorden,* Viipuri, 16 bls.
Jay Madden Corp., *Carolina Thorden,* Kotka, 284 pkgs., 26 rolls.
Jay Madden Corp., *Scanyork,* Wiborg, 177 rolls, 50 tons.
H. Fuchs & Son, *Drottningholm,* Gothenburg, 42 crates.
Security Fur Seal Co., *Drottningholm,* Gothenburg, 26 bls.
Salwen Paper Co., *Drottningholm,* Gothenburg, 43 bls.
Jay Madden Corp., *Mormachawk,* Kotka, 19 rolls, 5 tons.

NEWARK IMPORTS

WEEK ENDING SEPTEMBER 23, 1939

Pagel Horton & Co., Inc., *Brosund,* Gefle, 2,550 bls. dry sulphate, 518 tons; 250 bls. dry sulphite, 50 tons.
——, *Brosund,* Iggesund, 5,100 bls. sulphate.
Pulp Sales Corp., *Carolina Thorden,* Viipuri, 1,590 bls. sulphite, 5,182 bls. wet sulphite.
H. G. Craig Co., Inc., *Kermic,* Donnacona, 328 rolls newsprint.

ALBANY IMPORTS

WEEK ENDING SEPTEMBER 23, 1939

——, *Brosund,* Ornskoldsvik, 1,291 bdls. wall board.
Pagel Horton & Co., Inc., *Brosund,* Ornskoldsvik, 150 bls. dry sulphite, 25 tons.
Price & Pierce, Ltd., *Brosund,* Ornskoldsvik, 1,800 bls. un-

bleached sulphate, 300 tons; 300 bls. unbleached sulphite, 50 tons.
———, *Brosund,* Iggesund, 1,125 bls. sulphite, 175 bls. bleached sulphite, 250 bls. kraft sulphate.
Pagel Horton & Co., Inc., *Brosund,* Hornesors, 2,400 bls. dry sulphite.

BOSTON IMPORTS

WEEK ENDING SEPTEMBER 23, 1939

Pulp Sales Corp., *Carolina Thorden,* Kotka, 780 bls. dry mechanically ground pulp.
E. Butterworth & Co., Inc., *Blommersdyk,* Rotterdam, 317 bls. pickerwaste.
———, *Blommersdyk,* Rotterdam, 358 bls. bagging.

PHILADELPHIA IMPORTS

WEEK ENDING SEPTEMBER 23, 1939

Jay Madden Corp., *Scanyork,* Helsingfors, 256 rolls newsprint, 257 rolls, 71 bls. wrapping paper.
Pulp Sales Corp., *Scanyork,* Helsingfors, 130 bls. dry mechanically ground pulp, 26 tons.
Neidich Process Co., *Scanyork,* Helsingfors, 94 bbls. tissue paper.
National City Bank, *Black Tern,* Antwerp, 267 bags casein, 20,347 kilos.
E. J. Keller Co., Inc., *Black Tern,* ———, 348 bls. bagging.
Loumar Textile By-Products, *Pipestone County,* Havre, 99 bls. rags.
J. M. Maris, *Pipestone County,* Havre, 9 cs. filter paper.
E. J. Keller Co., Inc., *Pipestone County,* ———, 49 bls. rags.
F. Weber & Co., *Schodack,* Havre, 1 cs. drawing paper.
Continental Bank Trust Co., *Mormacrey,* Buenos Aires, 71 bls. rags.

BALTIMORE IMPORTS

WEEK ENDING SEPTEMBER 23, 1939

———, *City of Flint,* Glasgow, 135 rolls newsprint.
Pulp Sales Corp., *Carolina Thorden,* Viipuri, 792 bls. bleached sulphate.
Pulp Sales Corp., *Carolina Thorden,* Kotka, 520 bls. dry mechanically ground pulp.
Wilkinson Bros., & Co., Inc., *Carolina Thorden,* Kotka, 166 rolls newsprint.
Pulp Sales Corp., *Carolina Thorden,* Kotka, 350 bls. bleached sulphate.
Pulp Sales Corp., *Carolina Thorden,* Helsingfors, 520 bls. dry mechanically ground pulp.
Pulp Sales Corp., *Scanyork,* Helsingfors, 650 bls. sulphite, 108 tons; 1,820 bls. dry mechanically ground pulp, 364 tons.
Jay Madden Corp., *Scanyork,* Wiborg, 462 rolls newsprint.
Pulp Sales Corp., *Scanyork,* Wiborg, 3,020 bls. bleached sulphite, 555 tons; 264 bls. bleached sulphate, 52 tons.
Price & Pierce, Ltd., *Hammaren,* ———, 210 bls. bleached sulphite.

NORFOLK IMPORTS

WEEK ENDING SEPTEMBER 23, 1939

Irving Trust Co., *City of Flint,* Manchester, 140 bls. bagging.
Pulp Sales Corp., *Carolina Thorden,* Kotka, 3,510 bls. dry mechanically ground pulp.
Champagne Paper Corp., *Pipestone County,* Havre, 388 cs. cigarette paper.
R. J. Reynolds Tobacco Co., *Pipestone County,* St. Nazaire, 1,964 cs. cigarette paper.
American Tobacco Co., *Pipestone County,* Bordeaux, 422 cs. cigarette paper.
H. H. Strauss, *Pipestone County,* Bordeaux, 118 cs. cigarette paper.

NEWPORT NEWS IMPORTS

WEEK ENDING SEPTEMBER 23, 1939

De Manduit Paper Corp., *Pipestone County,* Havre, 389 cs. cigarette paper.
De Manduit Paper Corp., *Schodack,* Havre, 116 cs. cigarette paper.
———, *Blommersdyk,* Rotterdam, 156 rolls newsprint.

Paper Men in Golf Finals

[FROM OUR REGULAR CORRESPONDENT]

PHILADELPHIA, Pa., September 25, 1939—Against a big field of entries at the final golf tournament for the 1939 season of the Philadelphia Paper & Cordage Association, held on Wednesday last at Pine Valley Golf Club, Edward Weihenmayer, Jr., of Jessep & Moore Paper Company, carried off the honors. Mr. Weihenmayer, a former captain of the Pennsylvania Golf Team, shot a 84 for 18 holes and a total of 172 strokes for 36 holes. He also won the kickers handicap. His playing partner, Bob McCaffrey, a former football star of Pennsylvania, won the low net prize for 36 holes. Albert Malry won the low net prize for 18 holes, and J. Cotter won the prize for second low gross. The putting contest was tied between C. J. Williams and J. W. Hoskins, and the committee decided to award duplicate prizes to these two winners. Edward Sickles of Bulkly Dunton and Company, paper merchants of New York City, was in H. H. Hanson's foursome of W. W. Hamilton. Mr. Sickles' match play was excellent although his medal score was not low enough to capture a prize. Frank A. O'Neill of Paper Manufacturers played a special match with R. T. Shaw of Lee Rubber Company, Mr. Shaw being the winner.

At the conclusion of the tournament thirty-five of the players dined at the Silver Lake Inn. E. L. Richards, chairman of the golf committee, presented Eddie Weihenmayer with a sandblaster and golf balls; A. Malry a cash-in putter; J. Cotter golf balls; Bob McCaffrey golf balls; C. J. Williams and J. W. Hoskins golf balls.

The finals for the Buffalo Envelope Company trophy were played, and the winner of the 1939 season will be announced at the next meeting of the Philadelphia Paper and Cordage Association, which will be held at the Adelphia Hotel, October 20th at 12:30 P. M.

New Cape Terminal Handles Pulp

[FROM OUR REGULAR CORRESPONDENT]

CAPE VINCENT, N. Y., September 25, 1939—Another cargo of pulp wood for the Deferiet mill of the St. Regis Paper Company arrived here recently on a freighter from the Gulf of St. Lawrence and was immediately placed in railroad cars. The consignment was handled by the new Cape Terminals, Inc., which was organized recently. Prospects are that the St. Regis Paper Company will continue to use the pulp terminal in shipments to Northern New York branch plants and officials are looking for a busy fall season. Carl B. Martin, an official of the concern, was among those who advocated the deepening of the harbor here in order to increase trade.

Oxford Papers Are Discussed

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., September 25, 1939—A combination breakfast and sales meeting of the Oxford Paper Company, Rumford, Me., and Carter Rice & Co., Corp. at which the Oxford papers, coated and uncoated, were discussed was held at the Parker House September 16. E. A. Gordon, Ted Pell and N. R. Hopkins, executives of the Oxford Company in the New York office, and two representatives from the mill were present. Charles A. Esty, president, and Frank H. Winter, sales manager, of the Carter Rice Company, presided.

New York Market Review

Office of the PAPER TRADE JOURNAL,
Wednesday, September 27, 1939

The uptrend in business continues in all major industries and markets. Expansion has been rapid and caution has been advised by leading business men to prevent over-buying or speculation and thus create a runaway market. While a boom created by excessive speculative buying is undesirable, of course, the effect of a long period of relative low business activity, such as was experienced last year, and in the years prior to 1937, is also a deterrent to prosperity. A moderate amount of inflation to stimulate the depressed heavy industries is generally viewed as necessary to attain a good level of prosperity. According to good authority, business is now headed in the right direction and if inflation can be reasonably well controlled, as many economists seem to think can be done, no severe reaction or depressive result is likely to occur.

In referring to the state of the paper industry in September 24, 1914, when international trade and prices were then, as now, shifting, paper prices were advancing but buying was for immediate needs and prices were, in most cases, lower than at this date.

The index of general business activity for the week ended September 16 rose to 99.8 per cent, from 97.2 per cent for the preceding week, compared with 85.9 per cent for the corresponding week last year.

The price situation in newsprint remains unchanged. International, Abitibi and several other large producers have announced a price of $50 per ton for the first quarter of 1940. According to a leading authority, advertising linage for the month of August was 90.5 per cent, compared with 86.1 per cent for the like month last year, and with 99.2 per cent in 1937. The gain in consumption in August of this year was 6 per cent, compared with the same month last year. Manufacturers' stocks declined slightly.

Moderate advances in some grades of white paper have occurred and moderate increases in all grades of paper are generally expected in the trade under the substantial demand now indicated in reports from manufacturers' representatives, jobbers, and general paper merchants. Mills report orders running well ahead of production. Consumer demand for many grades of paper is expanding at an encouraging rate. While few price changes have been reported to date in white paper, the sharp advance in the price of casein has caused some mills to advance prices on some grades of coated papers from $5 to $10 per ton.

Mechanical Pulp

Demand continues active for mechanical pulp. Prices continue unchanged at this date. On September 24, 1914, domestic No. 1 mechanical pulp was quoted at $18.25 per ton, f.o.b., mill. The current quotation on domestic mechanical pulp is at from $38 to $40 per ton, delivered.

Chemical Pulp

No important change in contract quotations on any grade of imported or domestic pulp has been reported at this date. Shipments of Swedish pulp have been coming through on a much delayed schedule, with some cargoes reported missing. The British Government is now underwriting a war risk insurance rate of $1.50 a $100 to American shippers, and the same rate is now quoted by American insurance underwriters. The rate for neutral vessels is now $3.75 a $100 on westbound voyages and a rate of $5 a $100 on cargo carried on vessels of belligerent nations. On September 24, 1914, imported No. 1 bleached sulphite pulp are quoted at 3.50, unbleached at 2.35. The current quotations are 2.60 for bleached and 2.40 for unbleached sulphite pulp.

Old Rope and Bagging

Quotations on old domestic rope continue nominal, with no business reported in foreign rope. Prices on old bagging are nominal and mill buying is reported limited to urgent needs.

Rags

Quotations on domestic rags are largely nominal with the market firm and the trend upward. Roofing rags are very firm, No. 1 being currently quoted at from 1.75 to 2.00, and No. 2 at from 1.50 to 1.75; the larger the quantity, the higher the price. On September 24, 1914, new white No. 1 shirt cuttings were quoted at 6.50 to 7.00 and No. 1 roofing rags at from 1.35 to 1.35.

Old Waste Paper

The old waste paper market is very firm with advances reported in many grades this week. No. 1 mixed paper is currently quoted at from .70 to .75, corrugated at from .80 to .85, and strictly folded news at from .85 to .90. Book stock is also higher, with solid flat book currently quoted at from 1.00 to 1.10. On September 24, 1914, No. 1 mixed paper was quoted at from .42½ to .47½, strictly folded news at .55, and old kraft at 1.35.

Twine

The twine market reports prices continue to conform to prevailing quotations on all grades of hard and soft fiber twines. This market is firm and the trend is reported in some quarters of the trade as definitely upward.

Visit Byron Weston Co. Mill

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., September 28, 1939—A group of salesmen from John Carter & Co., Inc., and some of their customers visited the mills of the Byron Weston Company in Dalton, Mass., today to see the manufacture of paper.

Miscellaneous Markets

Office of the PAPER TRADE JOURNAL,
Wednesday, September 27, 1939.

BLANC FIXE—Quotations on blanc fixe are firm under a good demand with no change in prices reported for the current week. The pulp is currently quoted at from $42.50 to $45 per ton, in bulk; the powder is offered at from 3½ to 3¾ cents per pound, in barrels, at works.

BLEACHING POWDER—Prices on bleaching powder are firm and buying is reported active for the week. Bleaching powder is currently quoted at from $2 to $2.45 per 100 pounds, in drums, at works.

CASEIN—Quotations on casein are firm under an active demand. Standard domestic casein, 20-30 mesh, is currently quoted at 20 cents; 80-100 mesh, at 20½ cents per pound. All prices in bags, car lot quantities.

CAUSTIC SODA—Prices on caustic soda are firm under broad scale buying. Solid caustic soda is currently quoted at from $2.30 to $2.40 per 100 pounds; flake and ground at from $2.70 to $2.95 per 100 pounds, in drums, at works.

CHINA CLAY—Quotations on china clay continue firm under an active demand. Domestic filler clay is currently quoted at from $7 to $15 per ton; coating clay at from $11 to $22 per ton, at mines. Imported clay is offered at from $13 to $25 per ton, ship side.

CHLORINE—Prices on chlorine are firm and conform to prevailing market quotations. Chlorine is currently quoted at $1.75 per 100 pounds, in single-unit tank cars, f.o.b., works.

ROSIN—The rosin market is firm. Current quotations on some grades are higher. "G" gum rosin is quoted at $5.55 per 280 pounds, gross weight, in barrels, at Savannah. "FF" wood rosin is quoted at $5.35 per 280 pounds, gross weight, in barrels, New York. Seventy per cent gum rosin size is quoted at $3.92 per 100 pounds, f.o.b., shipping point.

SALT CAKE—Quotations on salt cake are firm under an active demand. Prices now range at from $15 to $19 per ton; chrome salt cake at from $14 to $15 per ton, f.o.b., shipping point. Quotations on imported salt cake are nominal.

SODA ASH—Prices on soda ash continue firm with continued heavy buying, reported for the current week. Prices on soda ash in car lots, at works, per 100 pounds, are as follows: in bulk, $.95; in bags, $1.10; and in barrels, $1.40.

STARCH—The corn starch market is firm, demand active and prices are a little higher for the week. Globe pearl is currently quoted at $2.75 per 100 pounds; special paper starch at $2.85 per 100 pounds; all prices in bags, f.o.b., Chicago.

SULPHATE OF ALUMINA—Quotations on sulphate of alumina are firm and unchanged at prevailing market levels. The commercial grades are quoted at $1.15; iron free at $1.30 per 100 pounds, in bags, car lot quantities, f.o.b., works.

SULPHUR—Prices on sulphur are firm under a good demand and continue unchanged at prevailing market quotations. Annual contracts are currently quoted at $16 per long ton, f.o.b., mines. Spot and nearby car lots are quoted at $19 per ton.

TALC—Quotations on talc are firm under a good demand and conform to prevailing market prices. Domestic talc is currently quoted at from $15 to $18 per ton. Eastern mines. Imported talc is quoted at from $23 to $45 per ton, on dock.

Market Quotations

Paper

(Delivered New York)

News, per ton—			
Roll, contract	**$50.00**	**●**	**—**
Sheets	**58.00**	**●**	**—**
Kraft—per cwt.—Delivered Zone A			
No. 1 Northern	$4.75	@	$5.25
Superstandard	4.25	@	4.75
Northern Standard Wrapping	**4.00**	**●**	**—**
Standard Wrapping	3.62½	@	—
Tissues—Per Ream—Carlots			
White No. 1	.87½	@	—
White No. 1 M. G.	.85	@	—
White No. 1½	.62½	@	—
White No. 2	.60	@	—
Anti-Tarnish M. G.	**.65**	**●**	**—**
Colored	**.77½**	**●**	**—**
Kraft	**.65**	**●**	**—**
Manila	**.60**	**●**	**—**
Unbl. Toilet, 1 M.	3.25	@	—
Bleached Toilet	**5.26**	**●**	
Paper Towels, Per Case—			
Unbleached, Jr.	1.80	@	—
Bleached, Jr.	3.10	@	—
Manila—per cwt.—C. l. f. a.			
No. 1 Jute	**7.75**	**●**	**9.75**
No. 1 Manila Wrapping, 35 lb.	**5.00**	**●**	**—**
No. 2 Manila Wrapping, 35 lb.	**4.75**	**●**	**—**
Boards, per ton—			
News	42.50	@	—
Chip	40.00	@	—
Sgl. Mla. LL Chip	52.50	@	—
Jute Lined Chip	52.50	@	—
White Pat. Coated	65.00	@	—
Kraft Liners	**45.00**	**●**	**—**
Binders Boards	**71.00**	**●**	**77.00**

The following are representative of distributors' resale prices:

Rag Content Bonds and Ledgers—White, Assorted Items, Delivered in Zone 1:

	Bonds		Ledgers	
100% Rag Ext. No. 1.	$39.10 ●	$46.00	$40.25 ●	$47.25
100% Rag	31.05 ●	36.50	32.20 ●	37.75
85% Rag	.....		29.90 ●	35.00
75% Rag	23.60 ●	27.75	24.75 ●	29.00
65% Rag	.....		21.65 ●	26.25
50% Rag	17.55 ●	21.50	18.70 ●	22.75
25% Rag	14.65 ●	17.75	15.80 ●	19.25

Colors at $1.00 cwt. extra.

Sulphite Bonds and Ledgers—White, Assorted Items, Delivered in Zone 1:

	Bonds		Ledgers	
No. 1	$8.60 ●	$10.50	$9.75 ●	$12.00
No. 2	7.70 ●	9.50	8.90 ●	10.75
No. 3	6.75 ●	8.25	7.90 ●	10.00
No. 4	7.00 ●	8.50	8.20 ●	10.00

Colors $1.00 cwt. extra.

Free Sheet Book Papers—White, Cased Paper, Delivered in Zone 1:

No. 1 Glossy Coated	$11.30	●	$12.75
No. 2 Glossy Coated	9.70	●	11.00
No. 3 Glossy Coated	8.60	●	10.00
No. 4 Glossy Coated	8.05	●	9.25
No. 1 Antique (watermarked)	8.05	●	9.25
No. 2 Offset	7.45	●	8.50
A Grade E. F.	7.20	●	8.25
A Grade S. & S. C.	7.45	●	8.50
B Grade E. F.	6.65	●	7.75
B Grade S. & S. C.	6.90	●	8.00
C Grade E. F.	6.40	●	7.50
C Grade S. & S. C.	6.65	●	7.75
D Grade E. F.	6.10	●	7.00
D Grade S. & S. C.	6.35	●	7.25

Ivory & India at $.50 cwt. extra

Mechanical Pulp

(On Dock, Atlantic Ports)

No. 1 Imported—			
Moist	28.00	@	32.00
Dry	28.00	@	32.00
(Delivered)			
No. 1 Domestic and Canadian	38.00	@	40.00

Chemical Pulp

(On Dock, Atlantic, Gulf and West Coast Ports)

Bleached Sulphite (Domestic and Foreign)—			
Prime Bleached Sulphite	2.50	@	2.60
Prime Qualities—Easy-Bleaching Sulphite	2.20	@	2.40
Strong Unbleached Sulphite	2.15	@	2.40
(On Dock, Atlantic Ports)			
Kraft Bleached	2.50	@	3.00
Kraft Light & Strong	1.65	@	1.85
Kraft No. 1	1.65	@	1.80
(F. o. b. Pulp Mill)			
Kraft Domestic	1.60	@	2.00
(Delivered)			
Soda Bleached	2.55	@	—

Add 60 cents per short ton, dock charges for Albany; $2.50 for Lake Ports East and $3.50 for Lake Ports West of Mackinac Straits.

Domestic Rags

New Rags

All prices nominal.

(Prices to Mill f. o. b. N. Y.)

Shirt Cuttings—			
New White, No. 1	8.00	@	8.25
Silesias No. 1	**4.50**	**●**	**4.75**
New Unbleached	**6.75**	**●**	**7.00**
Blue Overall	**4.90**	**●**	**5.00**
Fancy	**1.75**	**●**	**2.00**
Washables	**1.50**	**●**	**1.60**
Mixed Khaki Cuttings	**2.25**	**●**	**2.50**
O. D. Khaki Cuttings	**3.25**	**●**	**3.40**
Old Rags			
White, No. 1—Repacked	**2.90**	**●**	**3.15**
Miscellaneous	**2.10**	**●**	**2.25**
White, No. 2—Repacked	**1.50**	**●**	**1.60**
Miscellaneous	**1.25**	**●**	**1.40**
Thirds and Blues—Repacked	**1.30**	**●**	**1.40**
Miscellaneous	**1.15**	**●**	**1.20**
Roofing Rags—			
No. 1	1.75	@	2.00
No. 2	1.50	@	1.75
No. 3 (bagging)	1.50	@	1.60
No. 4	**.60**	**●**	**.65**
No. 5A	**.60**	**●**	**.65**

Foreign Rags

All prices nominal

New Rags

New Dark Cuttings	**2.25**	**@**	**2.40**
New Mixed Cuttings	**2.00**	**@**	**2.20**
New Light Silesias	**5.50**	**●**	**5.75**
Light Flannelettes	**5.50**	**●**	**5.75**
New White Cuttings	**7.00**	**●**	**7.50**
New Light Oxford	**4.00**	**●**	**4.50**
New Light Prints	**3.00**	**●**	**3.25**
Old Rags			
No. 1 White Linens	**7.50**	**●**	**8.50**
No. 2 White Linens	**6.50**	**●**	**7.50**
No. 3 White Linens	4.50	@	—

J. Andersen & Co.

Selling Agents

21 East 40th Street

New York

CHEMICAL & MECHANICAL PULP

Kraft Pulp

BERGVIK OCH ALA NYA AKTIEBOLAG
Söderhamn, Sweden
KALIX TRÄINDUSTRI AKTIEBOLAG
Vanaffärden, Sweden
MUNKSUNDS AKTIEBOLAG
Munksund, Sweden
MENSJÖ CELLULOSA A.-B.
Sprängsvikan, Sweden

Bleached Sulphite

KELLNER-PARTINGTON PAPER PULP CO., LTD.
Sarpsborg, Norway
Edsvalla, Sweden
Hallein & Villach, Austria

Unbleached Sulphite

AKTIESELSKABET GREAKER CELLULOSEFABRIK
Greaker, Norway
BERGVIK OCH ALA NYA AKTIEBOLAG
Söderhamn, Sweden
CELLULOSEFABRIKS A.-G.
Bratislava, Czecho-Slovakia
SVANÖ AKTIEBOLAG
Svanö, Sweden

West Virginia Pulp and Paper Company

230 Park Ave.
New York

35 East Wacker Drive
Chicago

Public Ledger Building
Philadelphia, Pa.

503 Market St.
San Francisco, Cal.

Manufacturers of

ENGLISH FINISH SUPERCALENDERED
MACHINE FINISHED BOOK
and LITHOGRAPHIC PAPERS

Offset, Envelope, Bond, Writing, Mimeograph, Ledger, Eggshell, Cover and Music Papers, Index Bristol, Post Card and Label Papers

HIGH GRADE COATED BOOK

. . . .

KRAFT WRAPPING AND KRAFT ENVELOPE
KRAFT CYLINDER BOARD
BLEACHED SULPHITE AND SODA PULP
BLEACHED AND UNBLEACHED KRAFT PULP

MILLS:

Mechanicville, New York
Luke, Maryland
Covington, Virginia
Tyrone, Pennsylvania
Williamsburg, Pennsylvania
Cass, West Virginia
Charleston, South Carolina

THE DRAPER FELTS

All kinds and styles of Felts for all kinds and styles of Papers.

Write us about your Felt problems and let us help you reduce your Felt Costs—we will call anywhere at any time.

DRAPER BROS. COMPANY

CANTON, MASS.

Woolen manufacturers since 1856

ENGLISH ECCO CLAYS

ECCO CLAYS

UNIFORM • SUPERIOR • DEPENDABLE

English China Clays Sales Corporation
551 Fifth Avenue, New York City

No. 4 White Linens.	2.25	@	3.25
No. 1 White Cotton.	4.25	@	4.75
No. 2 White Cotton.	3.25	@	3.75
No. 3 White Cotton.	2.50	@	3.00
No. 4 White Cotton.	1.90	@	2.20
Extra Light Prints..	2.00	@	2.40
Ord. Light Prints...	1.75	@	2.15
Med. Light Prints...	1.55	@	1.95
Dutch Blue Cottons.	2.25	@	2.50
French Blue Linens..	3.00	@	—
Checks and Blues...	2.00	@	—
Linsey Garments....	1.90	@	2.00
Dark Cottons.....	1.50	@	1.60
Old Shopperies.....	1.30	@	1.45
New Shopperies.....	1.45	@	1.50
French Blues.....	2.25	@	2.50

Old Rope and Bagging

All prices nominal

(Prices to Mill, f. o. b. N. Y.)

Gunny No. 1—			
Foreign	1.60	@	1.75
Domestic	1.50	@	1.60
Wool Tares, light...	1.60	@	1.70
Wool Tares, heavy..	1.80	@	1.90
Bright Bagging.....	1.50	@	1.60
Manila Rope—			
Foreign	2.60	@	2.75
Domestic	2.75	@	3.00
Jute Threads.....	3.00	@	3.25
Sisal Strings	1.50	@	1.60
Mixed Strings....	.55	@	.60

Old Waste Papers

(F. o. b. New York)

Shavings—			
White Envelope Cuttings	2.30	@	2.40
Ordinary Hard White No. 1....	1.90	@	2.00
Soft White No. 1..	1.60	@	1.75
Soft White Extra..	2.25	@	2.40
Flat Stock—			
Stitchless	.80	@	.85
Overissue Mag.....	1.15	@	1.25
Solid Flat Book....	1.00	@	1.10
Crumbled No. 1....	.40	@	.45
Ledger Stock White.	1.30	@	1.40
Ledger Stock Colored	1.05	@	1.15
Manila—			
New Env. Cut....	1.40	@	1.50
New Cuttings.....	1.00	@	1.20
Old Kraft Machine— Compressed bales..	1.05	@	1.15
News—			
No. 1 White News	1.25	@	1.30
Strictly Overissue.	.40	@	.45
Strictly Folded....	.85	@	.90
Corrugated	.80	@	.85
No. 1 Mixed Paper..	.70	@	.75

Twines

(F. o. b. Mill)

(Soft Fiber)

Coarse Polished—			
India	.14½	@	—
White Hemp.....	.15½	@	—
Fine Polished—			
Fine India.....	.17¾	@	—
Unpolished—			
Box	.09¾	@	—
Paper Makers.....	.10¾	@	.11¼
Tube Rope.....	.11½	@	.13¾
Wall Paper.....	.12¼	@	—
Wrapping	.13¾	@	—
Soft Fiber Rope...	.12¾	@	.14¾
Cotton	.17¾	@	.20¾

(Hard Fiber)

Medium Java.....	.11	lb	.17
Mex. Sisal.....	.10	@	.16
Manila	.16	@	.23
Domestic	2.65	@	2.75
Sisal Rope.....	2.00	@	—
Mixed Rope.....	.45	@	.50
Transmission Rope..	2.00	@	2.25
Soft Jute Rope.....	2.25	@	2.50
Jute Carpet Threads.	.90	@	1.00
Gunny Bagging—			
Foreign	1.85	@	—
Domestic	1.75	@	—
Bleachery Burlap....	3.00	@	—
Scrap Burlap—			
Foreign	2.00	@	—
Domestic	1.75	@	—
Scrap Sisal.....	1.55	@	1.60
Scrap Sisal for Shredding	1.75	@	1.80
Wool Tares, Heavy..	1.40	@	1.50
New Burlap Cuttings	2.00	@	2.25
Aust. Wool Pouches.	2.75	@	—
Heavy Baling Bagging	1.90	@	—
Paper Mill Bagging..	.85	@	1.00
No. 2 Bagging.....	.45	@	.50

Domestic Rags (New)

(F. o. b. Boston)

Shirt Cuttings—			
New Light Prints...	.03¼	@	.03½
New White No. 1....	.0675	@	.0690
New Light Flannelettes	.05	@	—
Silesias No. 1.....	.04	@	.04½
New Black Silesias..	.03½	@	.03¾
Soft Unbleached....	6.50	@	7.00
Blue Cheviots	.05	@	.05¼
Fancy	.02	@	.02½
Washable	.02	@	.02½
Cottons—According to grades—			
Blue Overalls.....	.04¾	@	.05
New Black, sort...	.03¾	@	.04
Khaki Cuttings.....	.02½	@	.03
O. D. Khaki.....	.03	@	.03¾
Corduroy	.02¾	@	.03
New Canvas.....	.06¾	@	.07¼
B. V. D. Cuttings...	.06¾	@	.07

Domestic Rags (Old)

(F. o. b. Boston)

Canvas	.04¼	@	—
White No. 1—			
Repacked	—	@	2.75
Miscellaneous	2.50	@	2.75
White No. 2—			
Repacked	1.90	@	2.00
Miscellaneous	2.00	@	2.25
Twos and Blues.....	1.75	@	2.00
Old Blue Overalls...	1.50	@	—
Thirds and Blues—			
Repacked	1.37½	@	1.75
Miscellaneous	1.25	@	1.62½
Black Stockings.....	3.90	@	4.00
Roofing Stock—			
No. 1.....	1.00	@	1.10
No. 2.....	.65	@	.70
No. 3.....	.45	@	.50

Foreign Rags

(F. o. b. Boston)

Dark Cottons.....	.90	@	1.00
Dutch Blues.....	2.65	@	2.75
New Checks and Blues	2.85	@	3.00
Old Fustians.....	2.25	@	2.50
Old Linsey Garments.	2.10	@	2.25
New Silesias.....	3.75	@	4.00

PHILADELPHIA

Domestic Rags (New)

(Price to Mill, f. o. b. Phil.)

Shirt Cuttings—			
New White, No. 1.	.06	@	.06½
New White, No. 2.	.03½	@	.04
Light Silesias.....	.03½	@	.04
Silesias, No. 1....	—	@	.04½
Black Silesias, soft	.03	@	.03¼
New Unbleached..	.05½	@	.06
Washable, No. 1..	.01½	@	.01¾
Blue Overall.....	.04	@	.04½
Cottons—According to grades—			
Washable No. 2...	.01	@	.01¾
New Blue.....	.01	@	.01¾
Fancy Percales...	—	@	.02½
New Black Soft...	.03	@	.03½
New Light Seconds	—	@	.04½
New Dark Seconds	.50	@	.75
Khaki Cuttings—			
No. 1 O. D.....	.03	@	.03½
No. 2 Mixed.....	.02½	@	.02¾
Corduroy	—	@	.02
New Canvas.....	.05	@	.05½
New Black Mixed.	.02½	@	.02¾

Domestic Rags (Old)

White No. 1—			
Repacked	3.00	@	3.50
Miscellaneous	2.25	@	2.50
Thirds and Blues—			
Miscellaneous	1.50	@	1.55
Repacked	2.00	@	2.25
Black Stockings (Export)	3.00	@	3.50
Roofing Stock—			
Foreign No. 1.....	.90	@	1.10
Domestic No. 1....	1.55	@	1.60
Domestic No. 2....	1.40	@	1.45
Roofing Bagging...	1.30	@	1.35

Bagging

(F. o. b. Phila.)

Gunny, No. 1—			
Foreign	—	@	1.50
Domestic	2.00	@	2.25
Manila Rope.....	—	@	3.25
Sisal Rope.....	1.50	@	1.75
Mixed Rope.....	1.00	@	1.25
Scrap—			
No. 1.....	1.55	@	2.00
No. 2.....	1.30	@	1.35
Wool Tares, heavy..	3.25	@	3.50
Mixed Strings.....	.50	@	.60
No. 1 New Light Burlap	2.50	@	3.00
New Burlap Cuttings	1.75	@	2.00

Old Papers

(F. o. b. Phila.)

Shavings—			
No. 1 Hard White	2.25	@	2.30
No. 2 Hard White	1.90	@	2.00
No. 1 Soft White.	1.75	@	1.80
No. 2 Soft White.	1.40	@	1.50
No. 1 Mixed.....	.65	@	.75
Solid Ledger Stock..	1.45	@	1.50
Ledger Stock, white.	1.15	@	1.20
Ledger Stock, colored	.80	@	.90
No. 1 Books, heavy..	.75	@	.80
Manila Cuttings....	1.45	@	1.50
Print Manila.....	.60	@	.65
Container Manila....	.55	@	.60
Kraft Paper.....	.75	@	.80
No. 1 Mixed Paper..	.50	@	.55
Straw Board Chip...	—	@	.50
Binders Board Chip..	—	@	.50
Corrugated Board....	.60	@	.65
Overissue News.....	.70	@	.75
Old Newspapers.....	.55	@	.60

BOSTON

Old Papers

(F. o. b. Boston)

Shavings—			
No. 1 Hard White	2.25	@	2.50
No. 1 Soft White.	1.85	@	2.15
No. 2 Mixed.....	.75	@	.80
Solid Ledger Books..	1.30	@	—
Overissue Ledger Stock	1.30	@	1.50
Mixed Ledgers.....	.85	@	.90
No. 1 Books, heavy..	.70	@	—
No. 1 Books, light..	.65	@	.75
Crumpled Stitchless Book Stock.....	.55	@	.65
Manila Env. Cuttings	1.70	@	1.85
Manila Envelope Cuttings, Extra Quality	2.00	@	2.10
No. 1 Old Manila...	.65	@	.70
White Blank News..	1.30	@	1.40
No. 1 Kraft.....	1.00	@	—
Mixed Papers.....	.52½	@	—
Print Manila	.45	@	.55
Container Manila....	.32½	@	.35
Old Newspapers.....	.32½	@	.35
Paper Wool Strings..	.60	@	.65
Overissue News.....	.45	@	.50
Box Board Chips....	.25	@	.30
Corrugated Boxes....	.70	@	—
Kraft corrugated boxes	.80	@	—
Screening Wrappers.	.40	@	.45

Bagging

(F. o. b. Boston)

Manila Rope—			
Foreign	2.50	@	2.65

CHICAGO

Old Papers

(F. o. b. Chicago)

Shavings—			
No. 1 White Envelope Cuttings....	1.80	@	1.90
No. 1 Hard White.	1.70	@	1.80
No. 1 Soft White..	1.50	@	—
Ledger & Writings..	.75	@	.80
Solid Books.....	.45	@	.50
Blanks	.90	@	—
Krafts	.45	@	.50
New Kraft Cuts.....	1.10	@	—
Manila Env. Cuts...	Nominal		
Ex. No. 1 Manila...	Nominal		
Print Manila	Nominal		
Overissue News.....	.35	@	—
Old Newspapers—			
No. 1 Folded News	.25	@	.30
No. 1 Mixed Paper	.15	@	.20
Roofing Stocks—			
No. 1.....	1.00	@	1.05
No. 2.....	.85	@	—

TORONTO

Paper

Bonds

Direct mill shipment in two-ton lots

No. 1 White	$35.50	@	—
No. 1 Tints	36.50	@	—
No. 2 White	25.50	@	—
No. 2 Tints	26.50	@	—
No. 2 Golden Rod..	27.50	@	—
No. 3 White	21.00	@	—
No. 4 White	15.00	@	—
No. 4 Tints	16.00	@	—
No. 4 Golden Rod...	17.00	@	—

Direct mill shipment in three-ton lots

No. 5 White	$10.50	@	—
No. 5 Tints	11.50	@	—
No. 5 Golden Rod..	12.00	@	—
No. 6 White	9.00	@	—
No. 6 Tints	9.50	@	—
No. 6 Golden Rod..	11.00	@	—
No. 7 White	8.00	@	—
No. 7 Tints	8.50	@	—
No. 7 Golden Rod..	10.00	@	—
Book—			
No. 1 M. F.	$7.00	@	—
No. 2 M. F.	6.50	@	—
No. 3 M. F.	5.35	@	—
No. 1 S. C.	7.25	@	—
No. 2 S. C.	6.75	@	—
No. 3 S. C.	5.85	@	—

Coated Book & Litho

Ton Lots (resale)

No. 1	$12.00	@	—
No. 2	10.25	@	—
No. 3	8.90	@	—
Coated tinted	13.00	@	—
Wrapping—delivered—			
Rag Brown.....	4.85	@	5.25
White Wrap.....	4.00	@	—
"B" Manila.....	4.90	@	6.15
No. 1 Manila.....	5.50	@	6.90
Fiber	5.50	@	6.90
Kraft No. 2.....	5.50	@	6.90

(F. o. b. Cars, Toronto)

News per ton—			
Rolls (contract)..46.80		@	—
Sheets 54.00		@	—

Pulp

Ground wood.....$29.00		@	—
Unbleached sulphite.	44.00	@	—
Bleached sulphite...	54.00	@	—
Kraft	50.00	@	—
Soda	54.00	@	—

Old Waste Paper

(In carload lots, f. o. b. Toronto)

Shavings—			
White Env. Cut...	2.00	@	—
Soft White.....	1.75	@	—
White Blk. News..	1.25	@	1.10
Book and Ledger—			
Flat Magazine and Book Stock (old)	.70	@	—
Light and Crumpled Book Stock.	.60	@	—
Ledgers and Writings	1.00	@	—
Manilas—			
New Manila Cut...	1.35	@	—
Printed Manilas...	.45	@	—
Kraft	.95	@	—
News and Scrap—			
Strictly Overissue..	.50	@	—
Strictly Folded....	.45	@	—
No. 1 Mixed Paper..	.30	@	—

Domestic Rags

(Price to Mills, f.o.b. Toronto)

No. 1 White Shirt Cuttings	.07	@	.07¼
Light Prints.....	.03¼	@	.03½